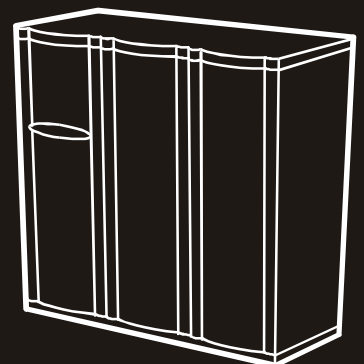


NetworkAIR® FM Precision Air Conditioner

Installation



Contents

General Information 1

Receiving the Equipment. 1

Receive and inspect the Module	1
Storing the Module before installation	2
Unpacking the Module	2
Moving the Module	3
Door locks	5

Cooling Configurations 6

Air-cooled	6
Water-cooled	6
Glycol-cooled	6
MultiCool™ option	7

Identifying Components 8

Downflow Module	8
Upflow Module	9
Electrical panel components	10
User interface box	11
Base assembly (upflow Module)	12
Floor stand	12
Plenum	13
Flooded receiver	13
Pump packages	14

Piping Diagrams 15

Air-cooled Module	15
Water-cooled Module	16
Glycol-cooled Module with single-pump package	17
Glycol-cooled Module with dual-pump package	18

Modules, Systems, and Groups 19

Module	19
System	19
Group	20

Pre-Installation.	21
Room preparation	21
Air distribution	21
Module placement	22
Incoming power	22
Service access	23
Supporting the Module	23
Weights	23

Dimensions of the Equipment	24
Packaged with shipping crate	24
Doors, panels, and main circuit breaker removed	24
Downflow Module	25
Upflow Module	25
Piping access location in bottom pan—top view	26
Pump packages	26

Installation 27

Removing the Doors and Panels	27
Removing the outer front doors	27
Removing the center front door	28
Removing the front facia	28
Removing the kick panel	29
Removing and installing side panels	30
Removing the rear panels	30

Removing the Main Circuit Breaker	31
How to remove the main circuit breaker	31

Floorstands	32
Assembling the Main Module floorstand	32
Assembling the Expansion Module floorstand	33
Installing the air diverter	34
Joining stands together	35
Electrical distribution box (optional)	35
Seismic floorstand (optional)	35
Installation	36

Sub-base	37
---------------------------	-----------

Placing the Module	38
Rigging	38
Place the Module on a sub-base (upflow only)	39
Place the Model on a floorstand	39
Joining Models together	40
Heat Exchangers	43
Flooded Receiver	44
Pump Packages	45
Expansion Tank	46
Mechanical Connections	47
Refrigeration piping	47
Length of common valves and fittings	48
Recommended line sizes	48
Water/glycol	48
Economizer Automatic Coolant Isolation Valve (optional)	49
Condensate pump	50
Piping connections	50
Electrical Connections	51
Control connections	52
Wiring the Outdoor Heat Exchanger connections	53
Wiring the input and output connections—PCIOM	53
Communication connections	54
DIP switch configuration	55
Wiring the Building Management System connections	56
Glycol system electrical connections	57
Remote condenser electrical connections	58
Main power connections	59
Plenums and Ducting	61
Installing the plenum	61
Ducting	61

Startup and Commissioning 63

Display Interface	63
-----------------------------	----

Using the Display	64
-----------------------------	----

Factory default settings	64
Start the system	64
Scrolling status screens	65
Main menu screen	65
Navigate the interface	66
Change settings	66
Password entry	67
Stop the System	67

Commissioning	68
-------------------------	----

Initial inspection	68
Electrical inspection	69
Mechanical/ refrigeration inspection	69
User interface box inspection	70
Functional test	71
System charging	72
Start-up inspection	73
Final inspection	73

Checklists 75

Initial Inspection Checklist	75
--	----

Electrical Inspection Checklist	77
---	----

Mechanical/Refrigeration Inspection Checklist	79
---	----

Mechanical Inspection: Air-cooled Checklist	81
---	----

Mechanical Inspection: Water/Glycol Checklist.	83
--	----

Mechanical Inspection: MultiCool Checklist	85
--	----

User Interface Box Inspection Checklist	87
---	----

Start-up Inspection Checklist	89
---	----

Final Inspection Checklist.	91
-------------------------------------	----

Warranty93

Warranty Statement 93

APC product covered	93
Terms of warranty	93
Warranty extends to first purchaser for use, non-transferable .	93
Assignment of warranties	94
Drawings, descriptions	94
Exclusions	94

Warranty Procedures..... 95

Claims	95
Labor	95
Parts	96

General Information

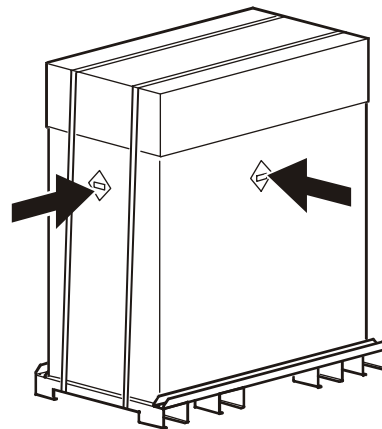
Receiving the Equipment

Receive and inspect the Module

Your NetworkAIR FM Precision Air Conditioner has been tested and inspected for quality assurance prior to shipment from APC. To ensure that the Module has not been damaged during transit, carefully inspect both the exterior and interior of the equipment immediately upon receipt.

Verify that all parts ordered were received as specified and that the Module is the correct size and voltage.

Inspect the exterior of the packaging. Locate the shock indicators on the exterior of the packaging. The shock indicators change from white to pink when activated. Note on the bill of lading any indications that the shock indicators have been activated.



Filing a claim. In the event that you identify damage during receipt of the Module, note the damage on the bill of lading and file a damage claim with the shipping company. Contact APC NetworkAIR technical services for information on how to file a claim with the shipping company. Because the equipment ships “FOB factory”, the shipping claim must be filed at the receiving end of the delivery. While



Note

If you detect shipping damage, contact the APC NetworkAIR technical services department at 1 (888) 695-6500.

Storing the Module before installation

If the Module will not be installed immediately, store the Module in a safe place, protected from the elements.



Leaving the Module uncovered and exposed to the elements can cause damage and void the factory warranty.

Unpacking the Module

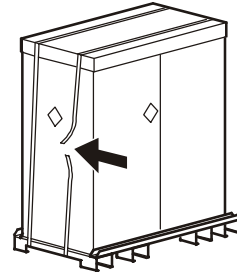


For safety reason and to prevent damage to the equipment, and when it's when possible, leave the Module on the skid until you are ready to place it on the floor support.

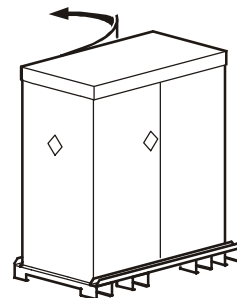


The shipping materials are recyclable. Please save them for later use, or dispose of them appropriately.

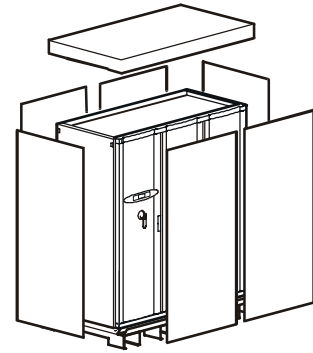
- 1 Remove the banding straps.



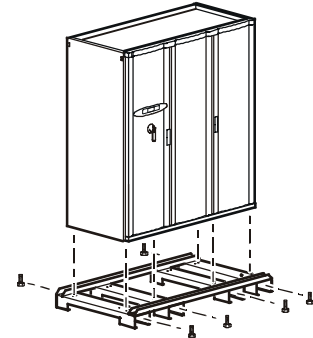
- 2 Remove the plastic wrap.



- ③ Remove the cardboard packaging.



- ④ Remove the six lag bolts holding the Module onto the pallet.
- Note:** When possible, leave the Module on the skid until you are ready to place it on the floor support.



Moving the Module

Moving the Module through door openings. Depending upon your installation, you may need to modify the Module to fit through smaller door openings.



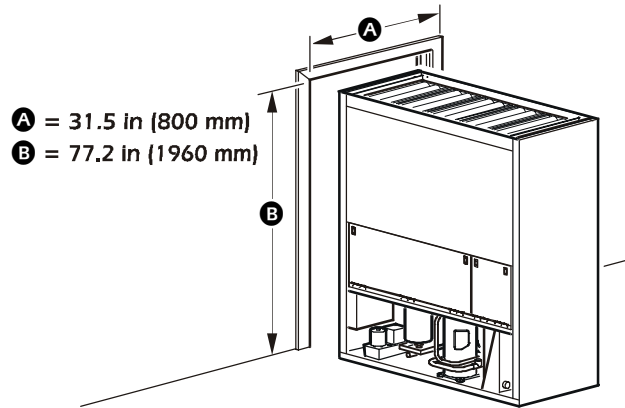
Refer to the dimensional drawing and the section “Dimensions of the Equipment” on page 24 to help determine if this is necessary.

If modifications are necessary, you can decrease the width of the Module by removing the doors, back panels, front fascia, kick panel, and main circuit breaker.



See “Removing the Doors and Panels” on page 27 for more information.

Minimum door opening



Move the Module to its final location. Select the appropriate tools for moving the Module. Each site will have different needs and considerations.

Casters (4)



Pallet jack



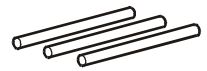
Furniture dollies (2)



Fork lift



Roller bars



Do not attempt to move the Module without assistance.



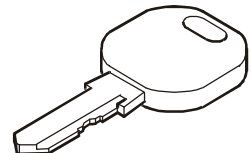
The Module has a high center-of-gravity. Use extreme caution as you unpack and move the Module.



When using a forklift to move equipment, make sure to lift only from the bottom.

Door locks

The left-and right-hand doors can be locked using the key is located inside the front-left door.

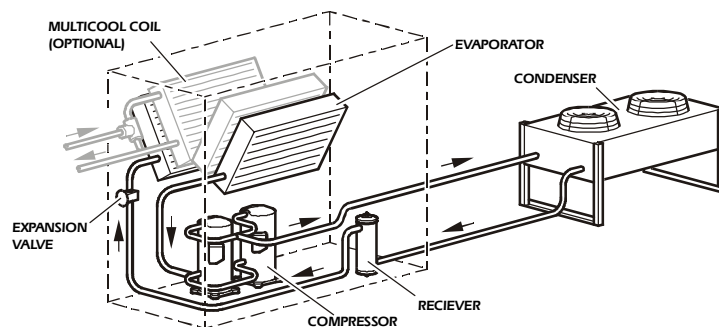


Cooling Configurations

FM Precision Air Conditioning Systems are available in air-cooled, water-cooled, and glycol-cooled configurations.

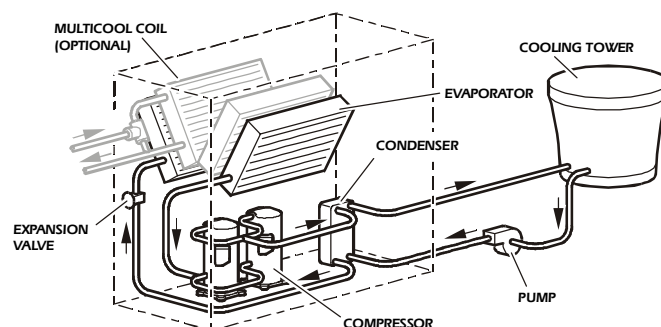
Air-cooled

Air-cooled systems are open from the factory, requiring field-installed refrigerant piping. Each installation requires an engineered piping solution.



Water-cooled

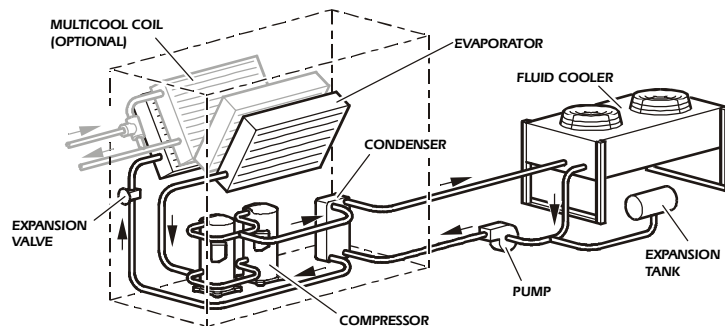
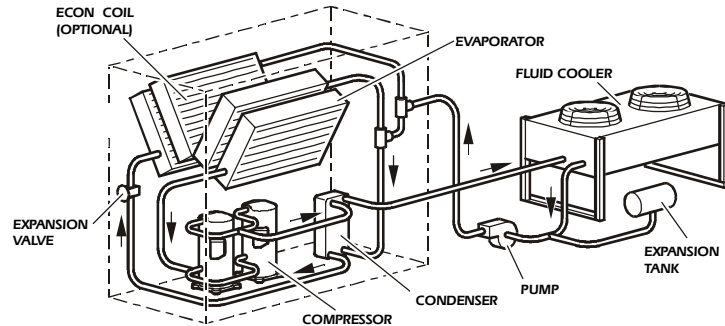
Water-cooled systems are completely charged and factory-tested as sealed systems. Cooling towers are used as a source of heat rejection and can be used to serve multiple indoor Modules. Towers using outdoor air require water treatment. Water piping to and from the Module is installed in the field.



Glycol-cooled

Glycol-cooled systems are completely charged and factory-tested as sealed systems and can include either an economizer or MultiCool™ coil option.

Economizer coil. To increase efficiency in mid- to low-ambient climates, use an economizer coil. Economizer operation greatly reduces the energy consumption of the system.

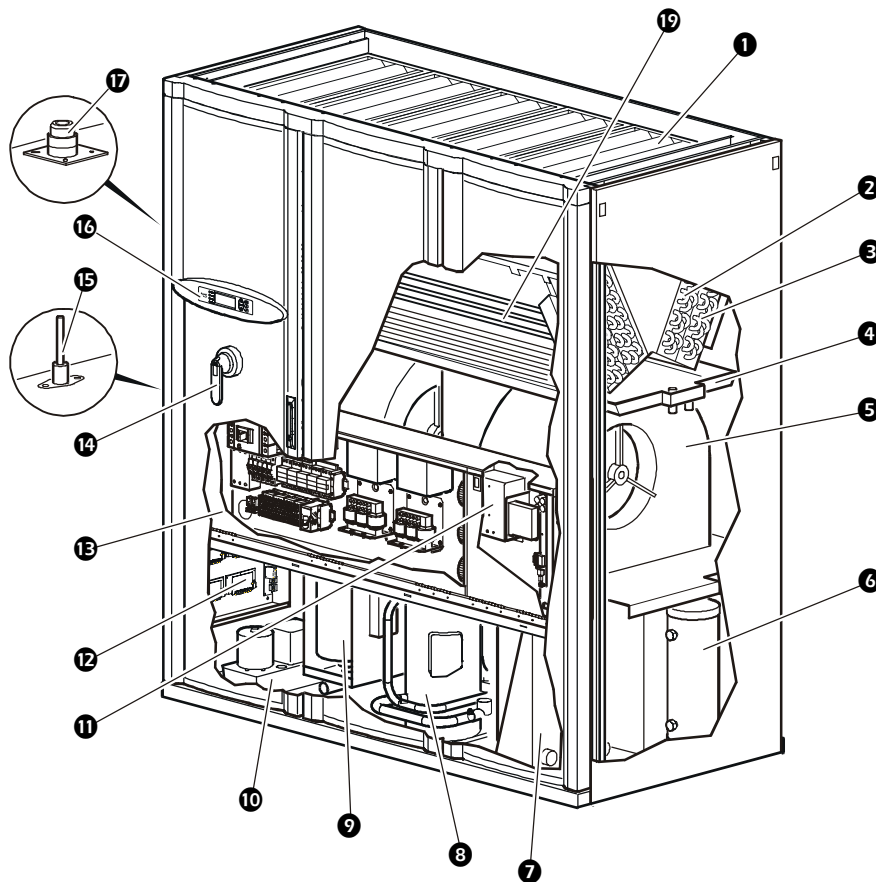


MultiCool™ option

MultiCool systems contain a chilled-water coil and direct-expansion coil within the same cabinet. Either cooling coil can be used as a backup to the other. These systems provide cooling by using either the building's chilled water or a direct expansion system.

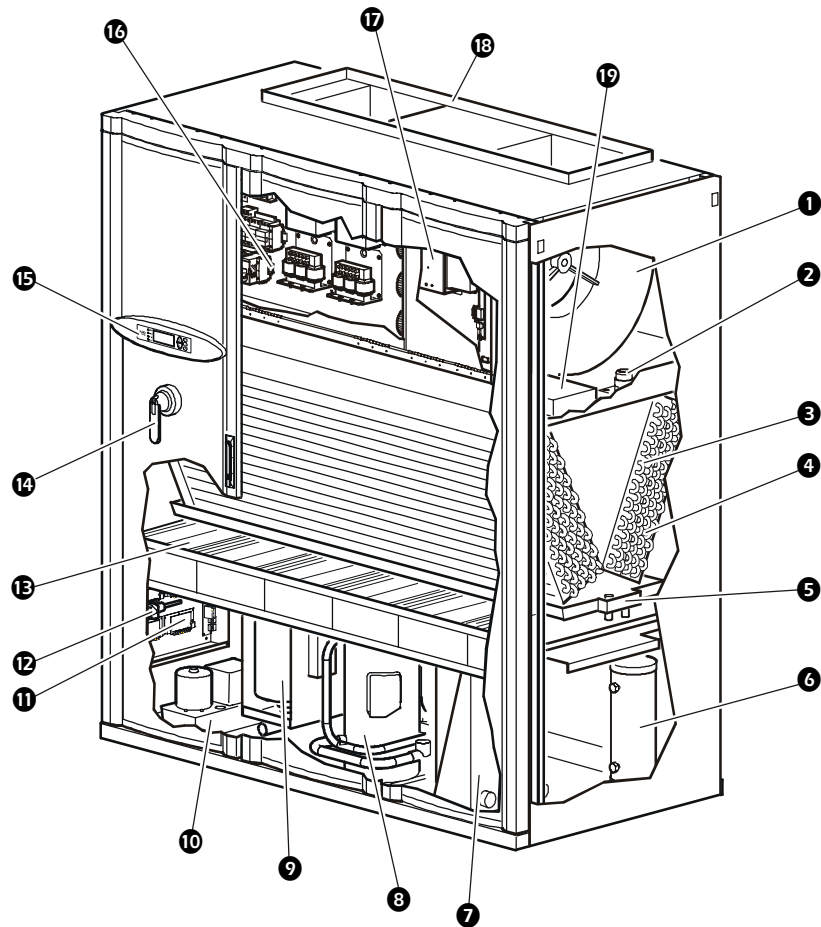
Identifying Components

Downflow Module



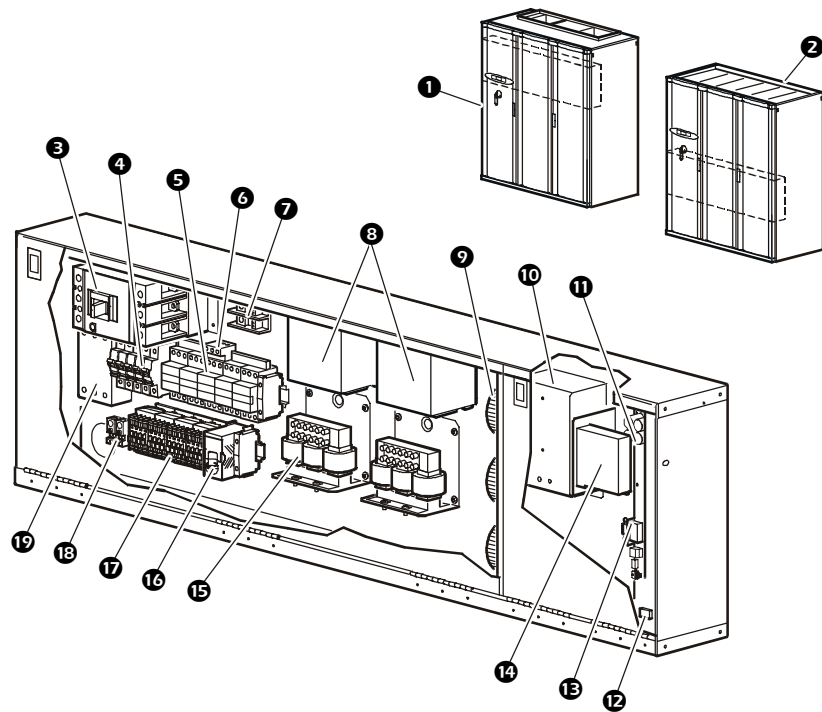
- | | |
|--|-----------------------------|
| ❶ Air filters | ❿ Condensate pump |
| ❷ Economizer coil (optional) | ⓫ Smoke detector (optional) |
| ❸ DX coil | ⓬ User interface box |
| ❹ Condensate pan | ⓭ Electrical panel |
| ❺ Motor and blower assembly | ⓮ Disconnect handle |
| ❻ Liquid refrigerant receiver | ⓯ Firestat (optional) |
| ❼ Brazed plate condenser (water and glycol models) | ⓰ Display interface |
| Ⓢ Tandem compressor | ⓱ Distributor nozzle |
| Ⓣ Humidifier | ⓲ Electric reheat coil |

Upflow Module



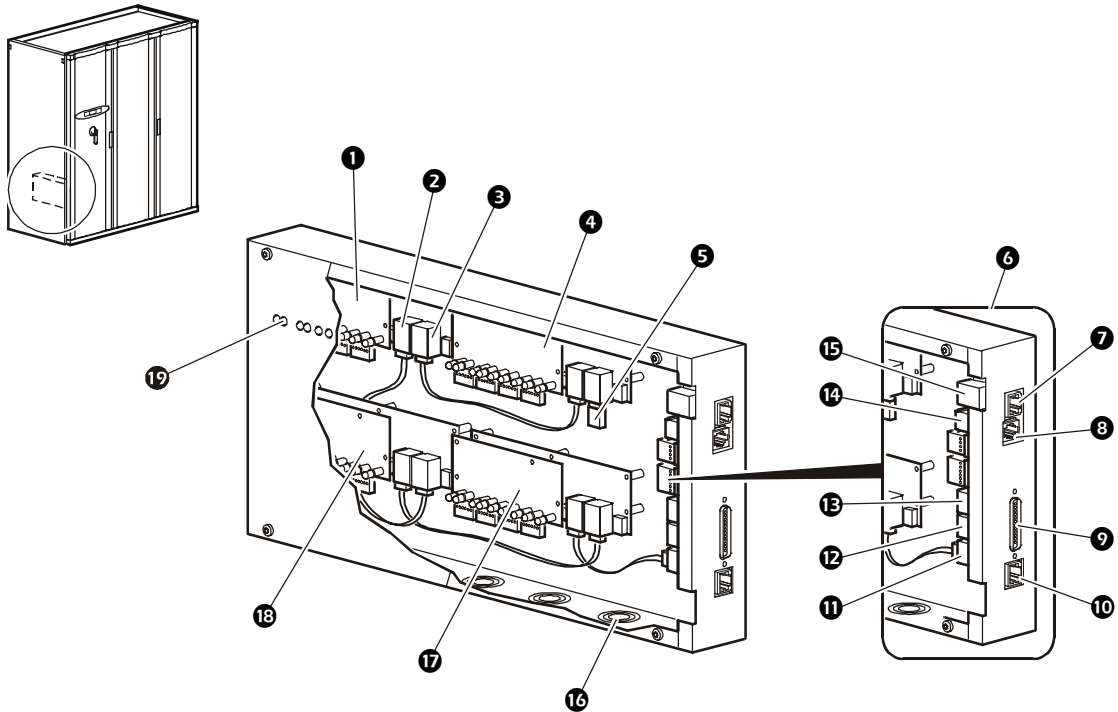
- | | |
|--|-----------------------------|
| ➊ Motor and blower assembly | ➋ User interface box |
| ➌ Distributor nozzle | ➍ Firestat (optional) |
| ➎ DX-coil | ➏ Air filters |
| ➐ Economizer coil (optional) | ➑ Disconnect handle |
| ➒ Condensate pan | ➓ Display interface |
| ➔ Liquid refrigerant receiver | ➖ Electrical panel |
| ➗ Brazed plate condenser (water and glycol models) | ➘ Smoke detector (optional) |
| ➙ Tandem compressors | ➚ Duct flange (optional) |
| ➛ Humidifier | ➜ Electric reheat coil |
| ➝ Condensate pump | |

Electrical panel components

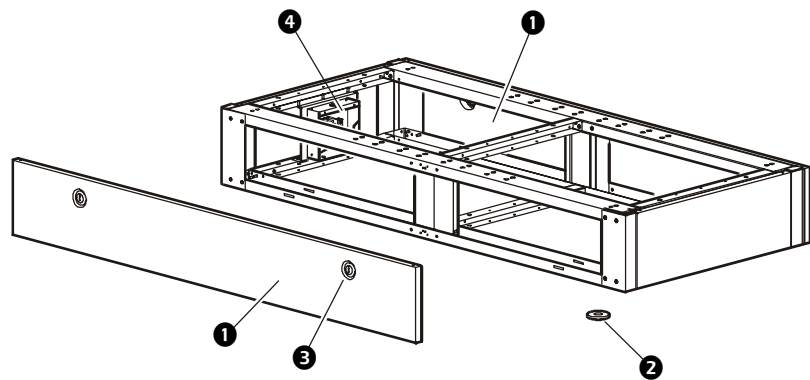


- | | |
|---------------------------------------|--------------------------------------|
| ❶ Upflow Module | ❶❶ Controller board |
| ❷ Downflow Module | ❶❷ DIP switches |
| ❸ Main circuit breaker | ❶❸ DB-9 connector/RS232 console port |
| ❹ Circuit breakers | ❶❹ Card slot |
| ❺ Fuses | ❶❺ AC line reactor |
| ❻ Input power terminal block | ❶❻ Heater fuse block |
| ❼ Terminal block | ❶❼ Contactors |
| ❽ Motor inverter/frequency controller | ❶❸ Ground lug |
| ❾ Control transformers | ❶❹ Reheat SCR control |
| ❿ Smoke detector | |

User interface box



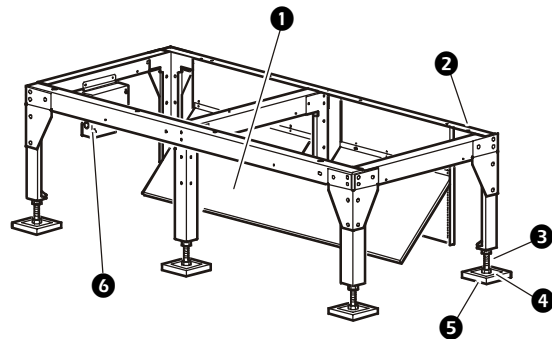
Base assembly (upflow Module)



- ❶ Removable front and rear panels
- ❷ Washer pads (6)
- ❸ 1/4-turn fasteners
- ❹ Electrical distribution box *

* optional

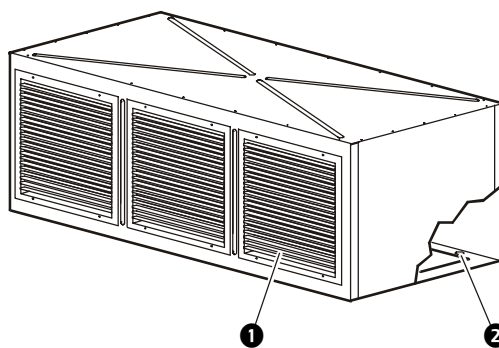
Floor stand



- ❶ Turning vain
- ❷ Module mounting holes
- ❸ Adjustable legs
- ❹ Pedestal
- ❺ Pad
- ❻ Electrical distribution box *

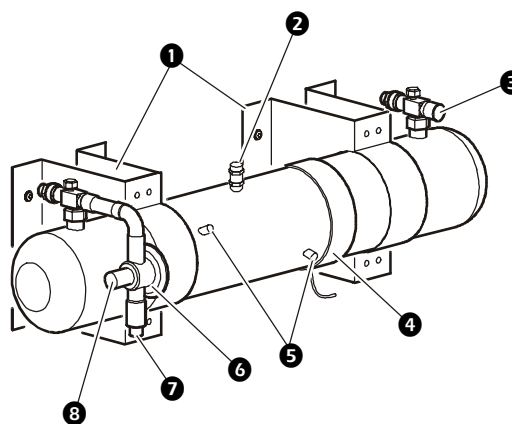
* optional

Plenum



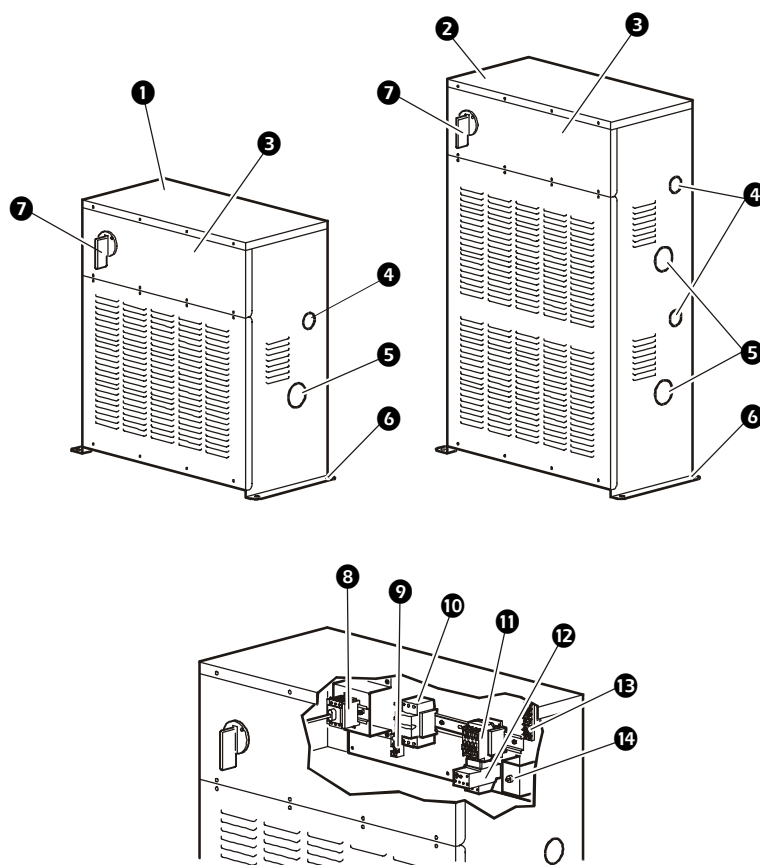
- ❶ Removable louvers ❷ Mounting holes (6)

Flooded receiver



- | | |
|---------------------|-------------------------------|
| ❶ Mounting brackets | ❺ Sight glasses |
| ❷ Relief valve | ❻ Head pressure control valve |
| ❸ Liquid line out | ❼ Hot gas in |
| ❹ Flexible heater | ❽ Liquid in from condenser |

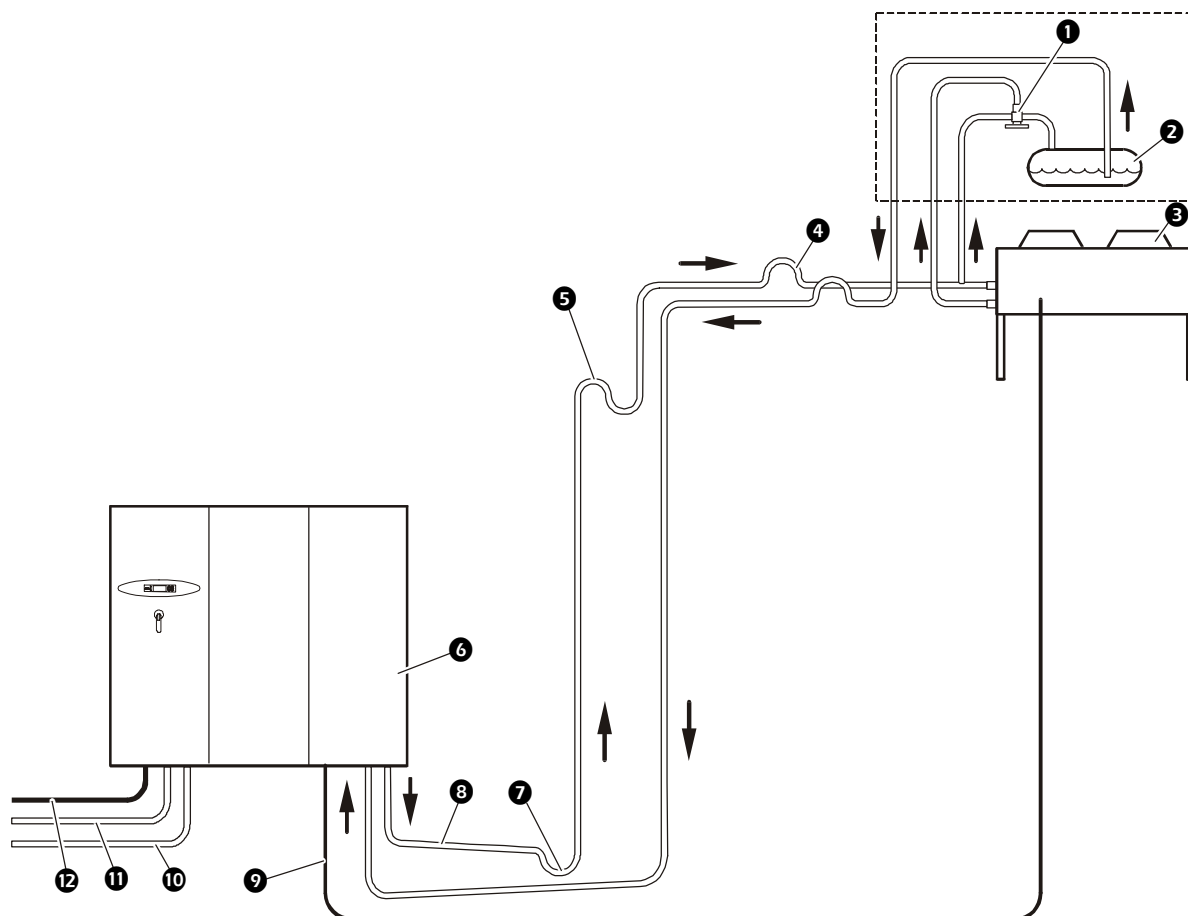
Pump packages



- | | |
|-----------------------------------|---------------------|
| ❶ Single-pump package | ❸ Disconnect switch |
| ❷ Dual-pump package | ❹ Ground lug |
| ❸ Pump control access | ❺ Fuse block |
| ❹ Discharge | ❻ Contactor |
| ❺ Suction | ❼ Overload relay |
| ❻ 1/2" (13 mm) mounting holes (4) | ❽ Terminal board |
| ❼ Disconnect switch handle | ❾ Pump reset switch |

Piping Diagrams

Air-cooled Module

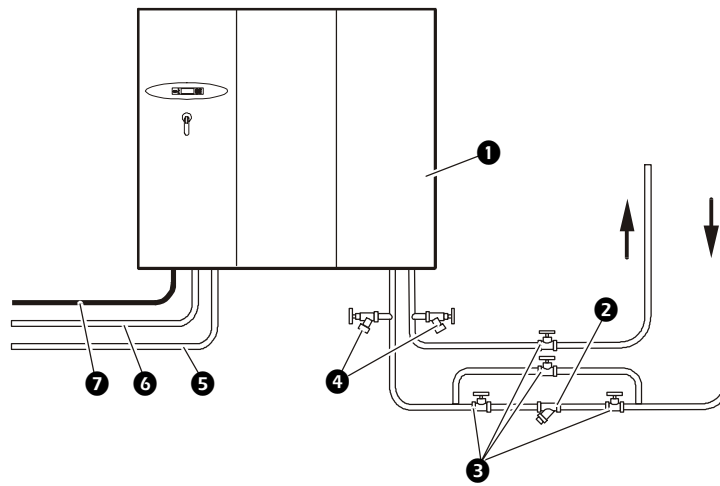


- | | |
|---------------------------------|--|
| ① Head pressure control valve** | ⑦ Inverted "P" trap |
| ② Flooded receiver** | ⑧ Pitch in direction of refrigerant flow, 1/2 in. per 10 ft. |
| ③ Condenser | ⑨ Control OHE interlock |
| ④ Inverted "P" trap | ⑩ Humidifier supply* |
| ⑤ "S" trap | ⑪ Condensate drain* |
| ⑥ Module | ⑫ Line voltage* |

* Items supplied by others

** Optional

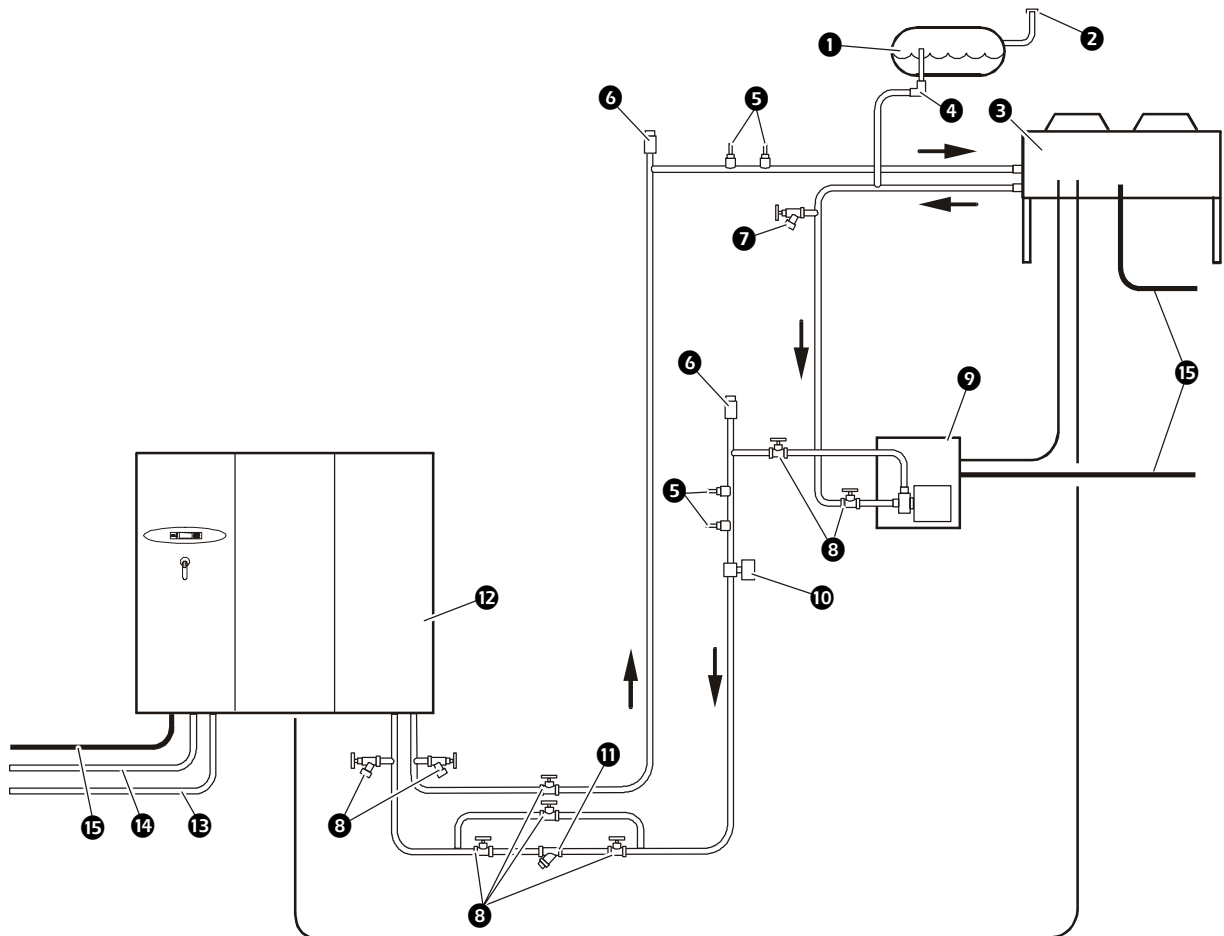
Water-cooled Module



- ❶ Module
- ❷ Strainer*
- ❸ Gate valve*
- ❹ Hose bib*
- ❺ Condensate drain*
- ❻ Humidifier water supply*
- ❼ Line voltage*

* Items supplied by others

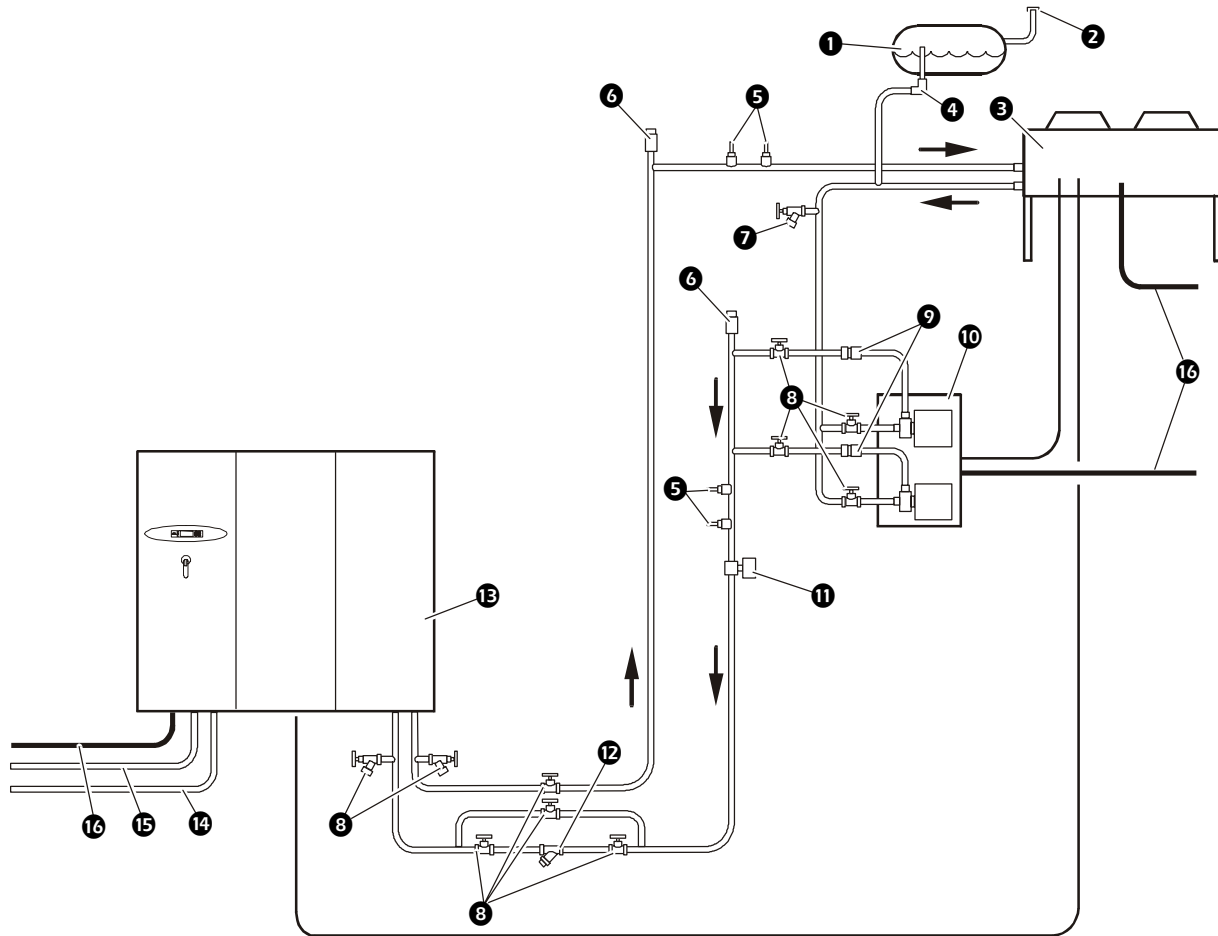
Glycol-cooled Module with single-pump package



- | | |
|------------------------------------|-----------------------|
| ❶ Expansion tank | ❹ Single-pump package |
| ❷ Tank fill * | ❺ Flow switch |
| ❸ Dry-cooler | ❻ Strainer * |
| ❹ Airtrol fitting | ❼ Module |
| ❺ Temperature and pressure gauge * | ❽ Humidifier supply * |
| ❻ Air vent * | ❾ Condensate drain * |
| ❼ Hose bib * | ❿ Line voltage * |
| ❽ Gate valves * | |

* Items supplied by others

Glycol-cooled Module with dual-pump package



- | | |
|-----------------------------------|----------------------|
| ❶ Expansion tank | ❹ Check valve* |
| ❷ Tank fill* | ❺ Dual-pump package |
| ❸ Dry-cooler | ❻ Flow switch |
| ❹ Airtrol fitting | ❼ Strainer* |
| ❺ Temperature and pressure gauge* | ❽ Module |
| ❻ Air vent* | ❿ Humidifier supply* |
| ❼ Hose bib* | ⓫ Condensate drain* |
| ❽ Gate valves* | ⓬ Line voltage* |

* Items supplied by others

Modules, Systems, and Groups

The NetworkAIR FM Precision Air Conditioning *Modules* and *Expansion Modules* can be combined mechanically and electronically to create *Systems* and *Groups*. When the System controls are linked together, up to four Systems can communicate to avoid demand-fighting and provide redundancy.

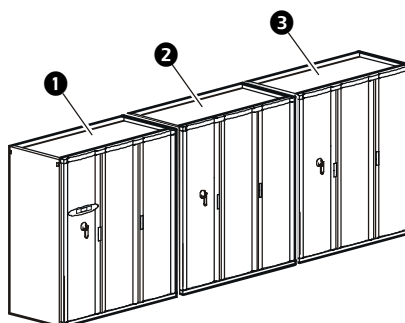
Module

A *Module* is an independent, self-contained air-conditioner which, when used below the System level, does not communicate with, nor is dependant upon, other Modules to function.



System

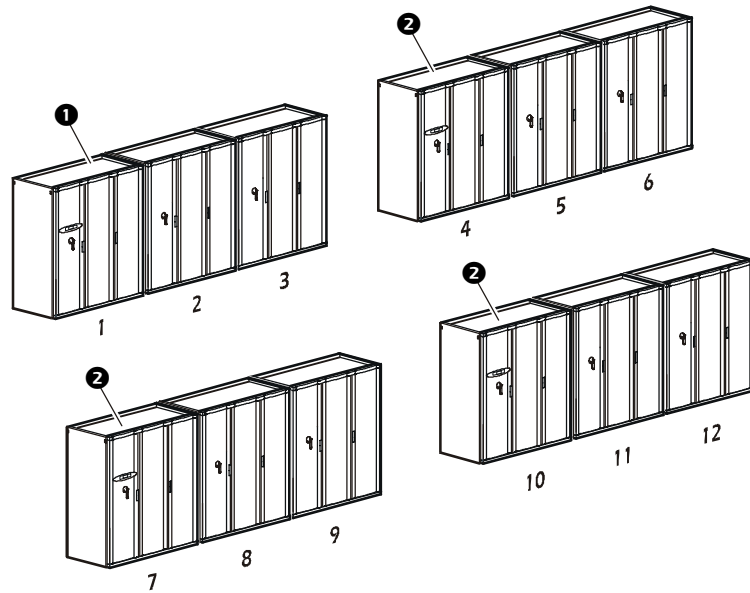
A *System* can be one, two, or three Modules mechanically and electronically connected. Each System will have one Main Module and up to two Expansion Modules.



- ❶ Main Module
- ❷ Expansion Module 1
- ❸ Expansion Module 2

Group

A *Group* is a set of up to four Systems connected mechanically and electronically containing one Main Module with a Group controller. Each System within the Group has a Main Module.



- ❶ Main Module and Group Controller
- ❷ Main Module

Pre-Installation

Room preparation

During the design of the data center, consider ease of entry for the equipment, floor loading factors, and accessibility to piping and wiring.

Seal the room with a vapor barrier to minimize moisture infiltration. (Polyethylene film is recommended for ceiling and wall applications.) Apply rubber or plastic-based paints to concrete walls and floors.

Thoroughly insulate the room to minimize thermal loads and keep make-up air to a minimum to reduce additional temperature, filtration, and moisture loads.

A computer room with a raised floor plenum for air distribution should have at least 12 inches of clear space between the false floor and sub-floor for air conditioners below 15 ton capacities. Pay special attention to the location of pipe chases, electrical conduits, and other under-floor obstructions. These objects can block air circulation and increase air pressure drops, which reduces system efficiency causing possible hot spots in the room. The minimum clear space for larger rooms should be 18 inches when air conditioners of 15 ton capacity and larger are used.

Air distribution

Downflow discharge. If the installation location of the Module has a raised floor, the space between the raised floor and subfloor can be used as an air distribution plenum. Downflow discharge Modules can be installed directly on the raised floor after ensuring that the floor can support the Module. A floorstand can be used where the floor cannot support the Module.

Raised floor. When installing Modules on a raised floor, maintain the correct amount of free area to allow proper air movement.

Consider under-floor obstruction that might prevent conditioned air from being properly distributed throughout the room.

Install an adequate number of perforated floor tiles to allow for proper air distribution in the conditioned space. Allow sufficient relief near heavier heat loads

Upflow discharge. In rooms designed for upflow discharge systems, air is distributed through a supply duct or through a discharge plenum into the conditioned space. The same Module location considerations for a downflow discharge system also apply to upflow discharge systems.



Note

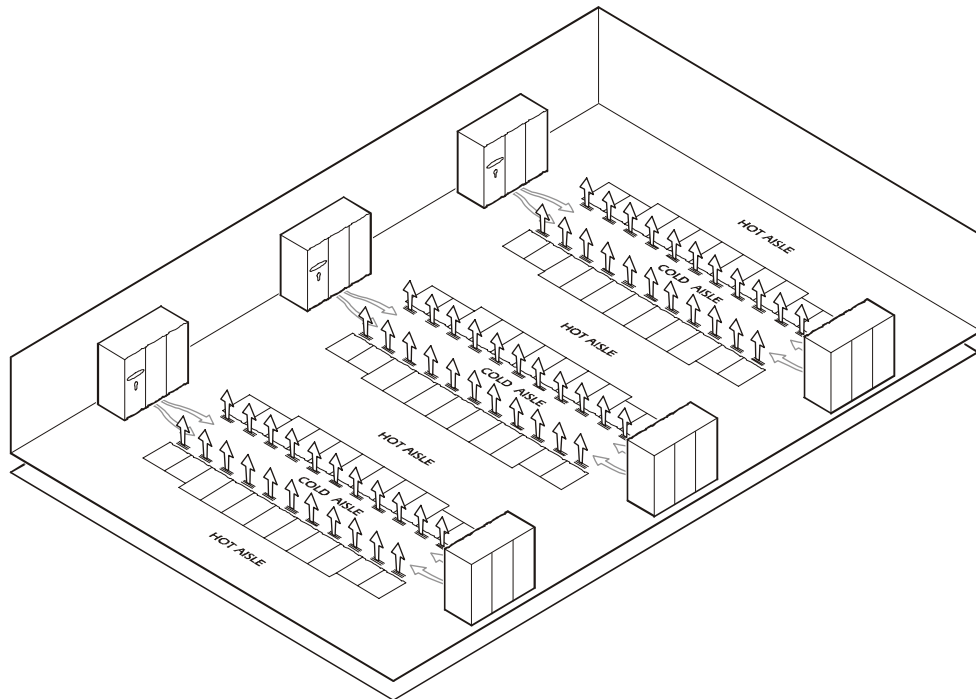
All Modules, except for MultiCool and Economizer, are designed for a maximum of 0.5 inch of external static pressure. MultiCool and Economizer are designed for 1.0 inch of external static pressure

Sub-base. When using an upflow Module, a sub-base is required to allow routing of supply and discharge elements, such as refrigeration, water, power, and drain lines.

Free discharge. Free discharge systems provide conditioned air to the conditioned space through a discharge plenum with two-way adjustable grilles located on top of the air conditioner.

Module placement

Location. The location of the Module is important for efficient environmental control in the data center. Locate the systems as close to the largest heat load as possible. Mount Modules along the longest walls (in rooms having a high aspect ratio) to ensure even air distribution. Erratic control or mechanical failure will result if the unit does not obtain proper air volume and distribution because of improper installation. Modules placed too close together or isolated from the heat load will reduce the effectiveness of the air distribution.



Incoming power

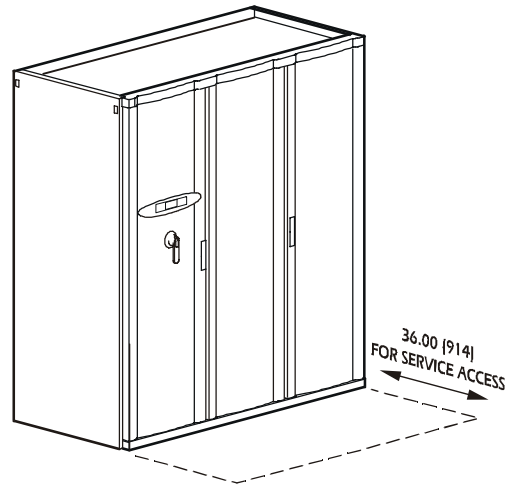


Note

The Module requires three-phase electrical service. Electrical service must conform to national and local electrical codes. The Module must be grounded to an earth ground.

Service access

An area of 36 inches (914 mm) of clear floor space in front of the Module is required for service. All required maintenance can be performed from the front of the Module.

**Supporting the Module**

Place the downflow Module either directly on the raised floor or on a floorstand.

**Note**

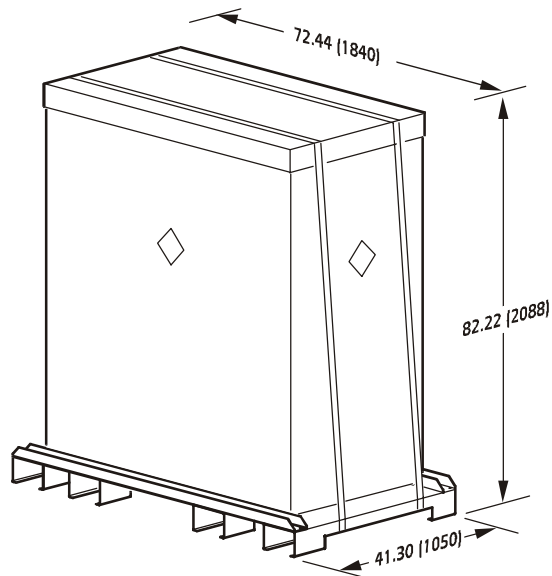
Consult your raised floor manufacturer for weight capacities if installing directly on the raised floor.

Weights

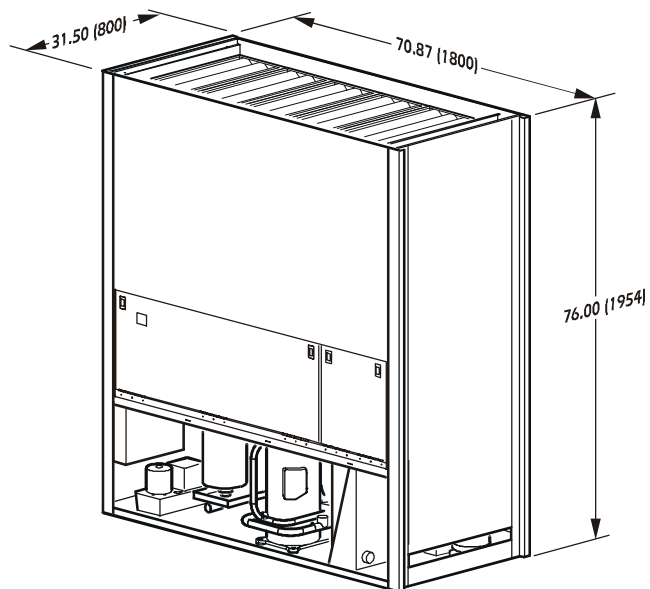
MODEL	FM 35	FM 40	FM 50
Air-cooled			
Weight (lbs)	1180	1180	1290
(kg)	535	535	585
Water-cooled			
Weight (lbs)	1215	1220	1380
(kg)	567	553	626
Glycol-cooled			
Weight (lbs)	1220	1230	1350
(kg)	553	558	612
Multi/Econ add			
Weight (lbs)	150	150	155
(kg)	68	68	70

Dimensions of the Equipment

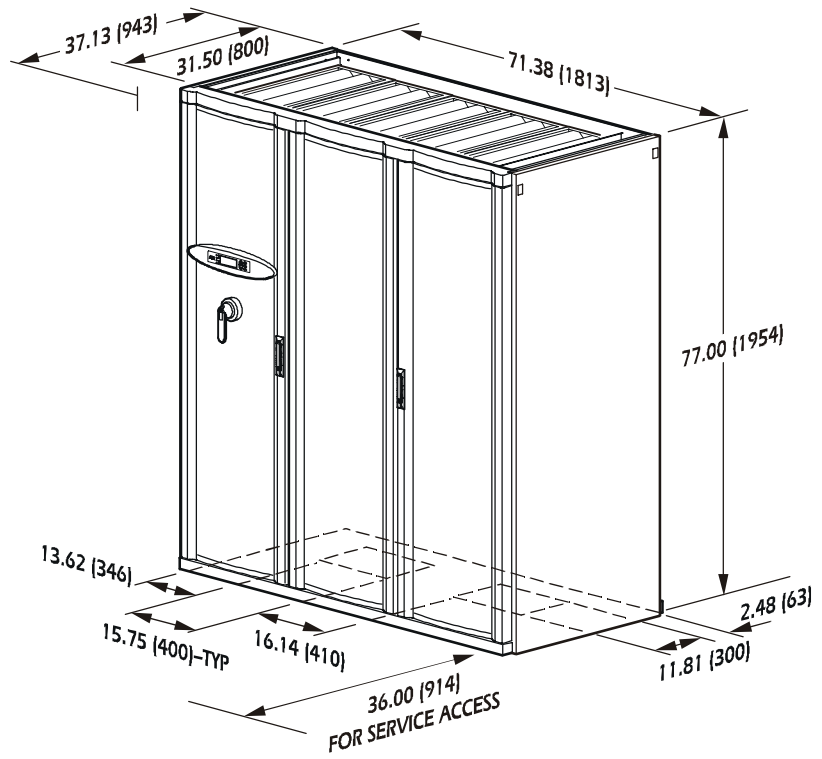
**Packaged with shipping
crate**



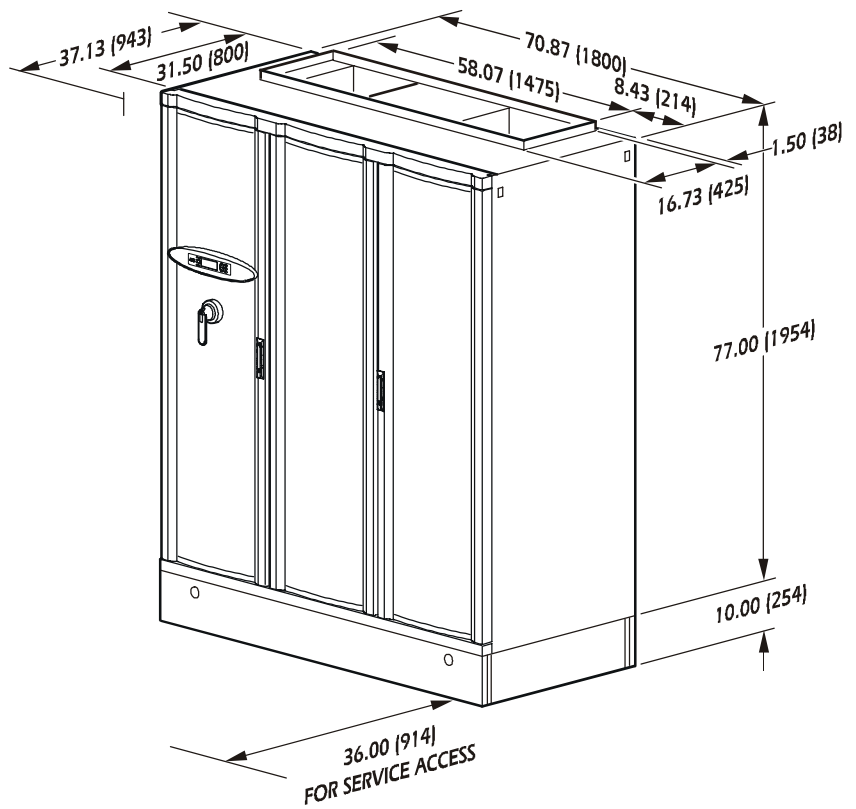
**Doors, panels, and main
circuit breaker removed**



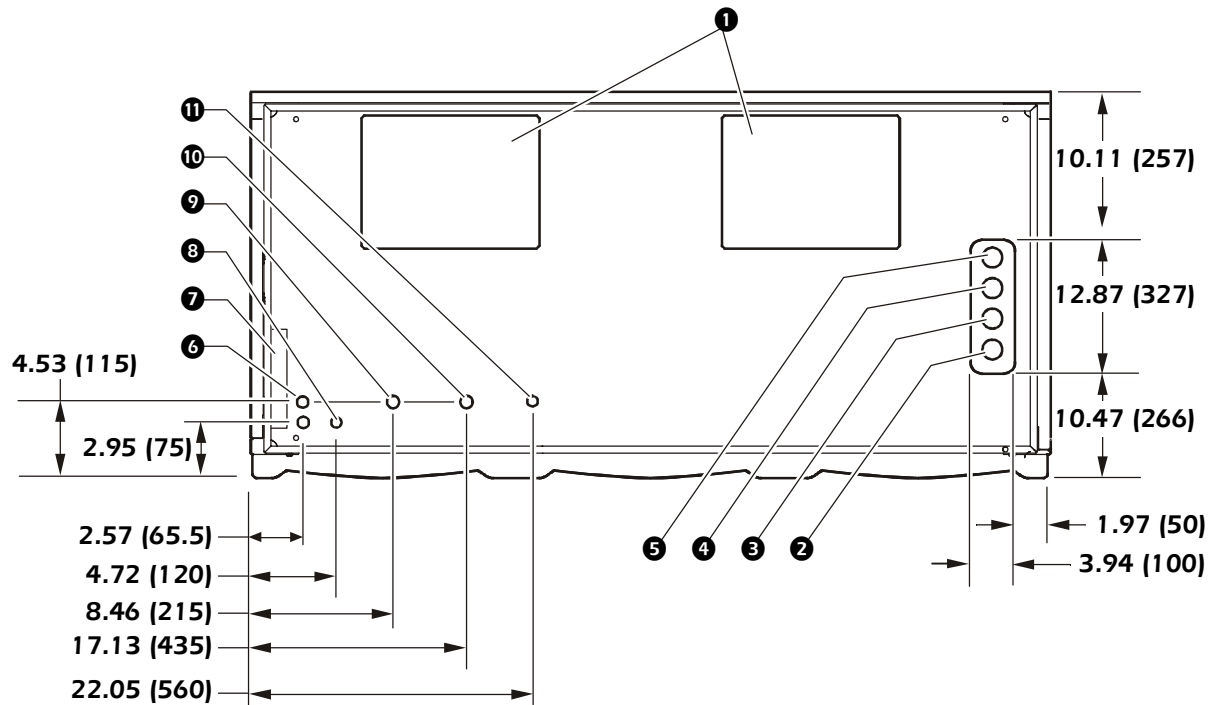
Downflow Module



Upflow Module

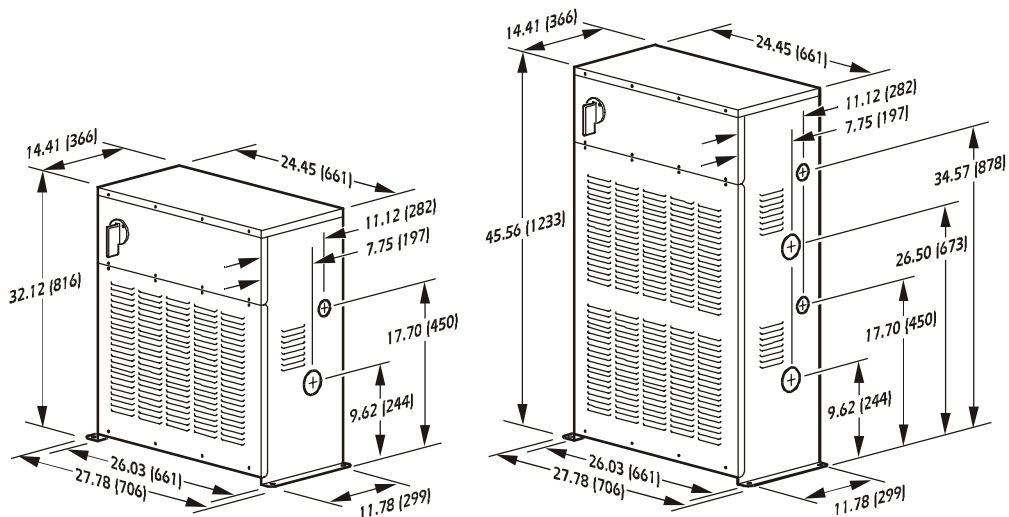


Piping access location in bottom pan—top view



- | | |
|-------------------------------------|-------------------------|
| ① Air outlets (downflow only) | ⑦ Control interface box |
| ② Water/glycol out or hot gas | ⑧ Downflow power entry |
| ③ Water/glycol in or liquid line in | ⑨ Condensate drain |
| ④ MultiCool or hot water out | ⑩ Humidifier fill |
| ⑤ MultiCool or hot water in | ⑪ Upflow power entry |
| ⑥ Control interface access | |

Pump packages



Installation

Removing the Doors and Panels



Door and panels are heavy. For safety, use at least two people when removing or installing.

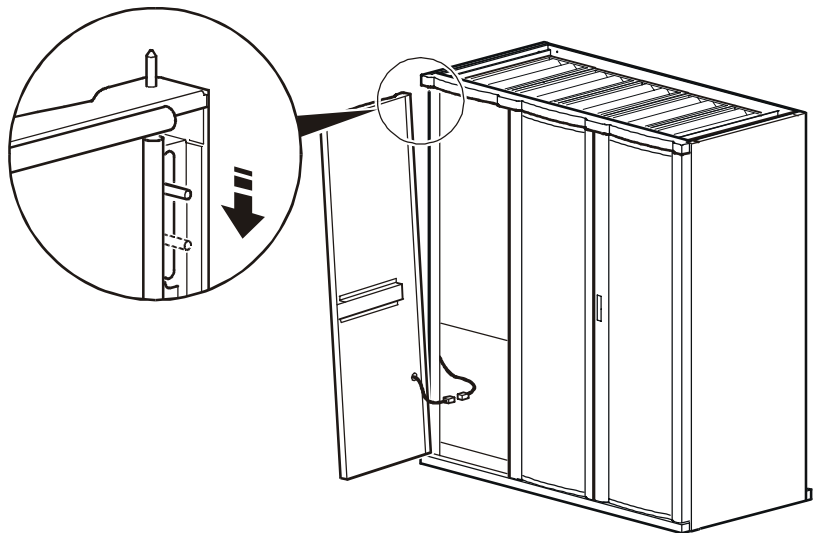
Removing the outer front doors

1. Open the door that you want to remove.
2. Pull down on the spring-loaded hinge pin located in the top of the door. Tilt the door forward and lift up to release it from the lower hinge pin.



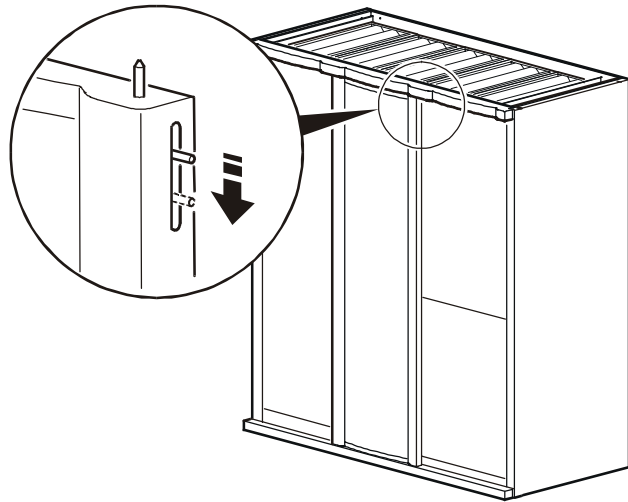
Note

To remove the left door, first disconnect the display interface.



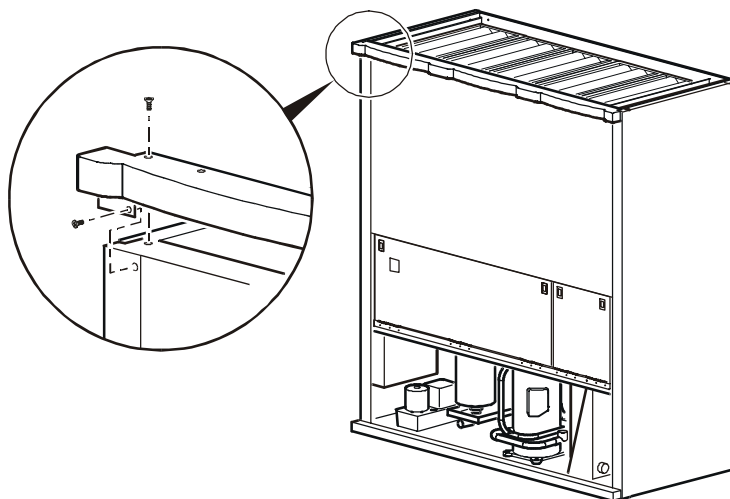
Removing the center front door

1. Open the left- and right-hand doors to gain access to the center panel's release mechanisms.
2. Pull down on the spring-loaded hinge pins located in the top of the door. Tilt the door forward and lift up to release it from the lower hinge pin.

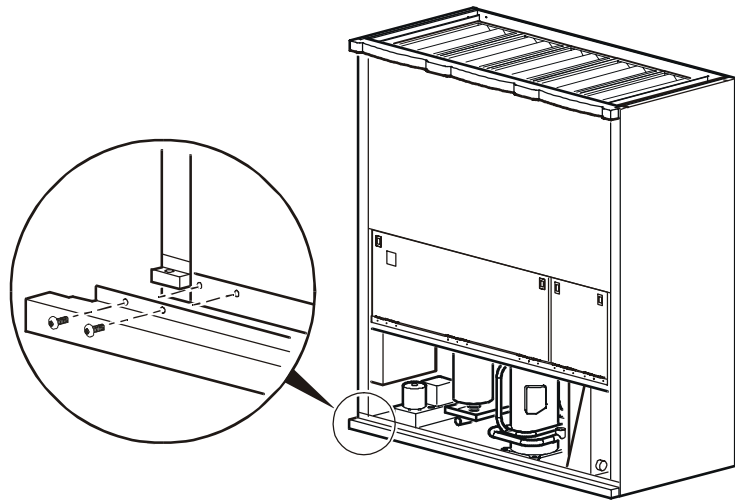


Removing the front facia

To remove the front facia, remove the five Torx screws located at the top of the facia and the two Torx[®] screws located on the front of the facia.



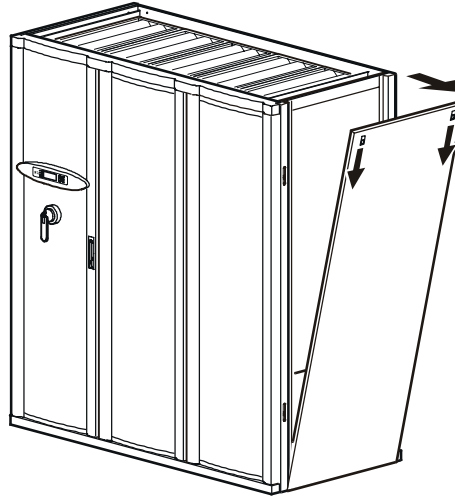
Removing the kick panel To remove the kick panel, remove the eight Torx screws from the top flange of the kick panel.



Removing and installing side panels

You may need to remove the side panels to access internal components or to join modules.

1. Slide both panel latches down and pull the top of the panel toward you.



2. Lift the panel up and out of channel located at the bottom of the frame.



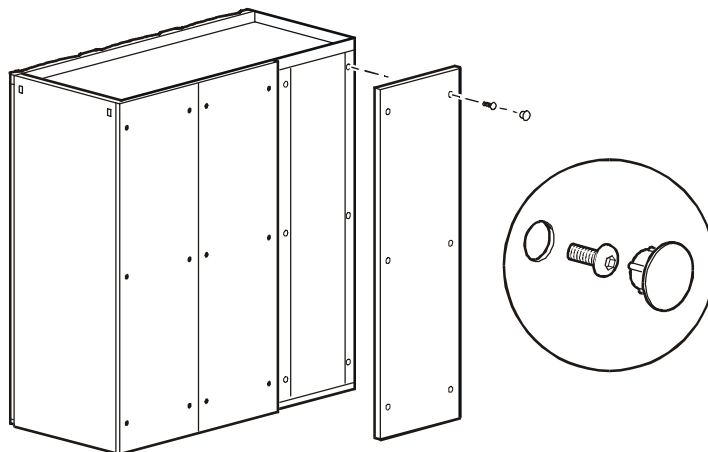
Note

Reverse the procedure above when installing side panels.

Removing the rear panels

To remove the rear panels:

1. Remove the cap plugs (six per panel).
2. Remove the Torx screws (six per panel).



Removing the Main Circuit Breaker

When moving the Module, you may need to modify it to fit through smaller door openings. To decrease the depth of the Module to 31.5 inches (800 mm), the main circuit breaker, located in the electrical panel, must be removed.

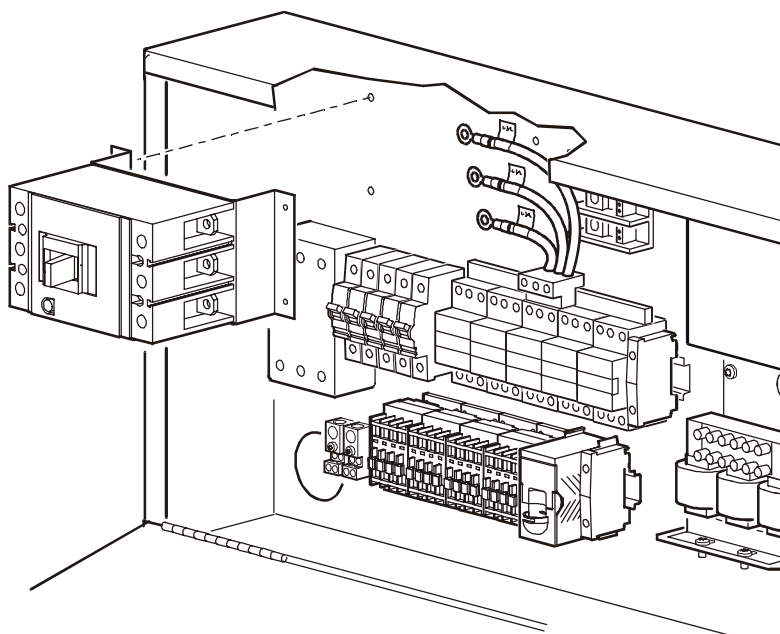


Warning

Before removing any electrical components, be sure to note the orientation of the electrical component and label all wires with their location.

How to remove the main circuit breaker

1. Mark and disconnect the wires at the main circuit breaker.
2. Remove the main circuit breaker by removing the four Torx screws.



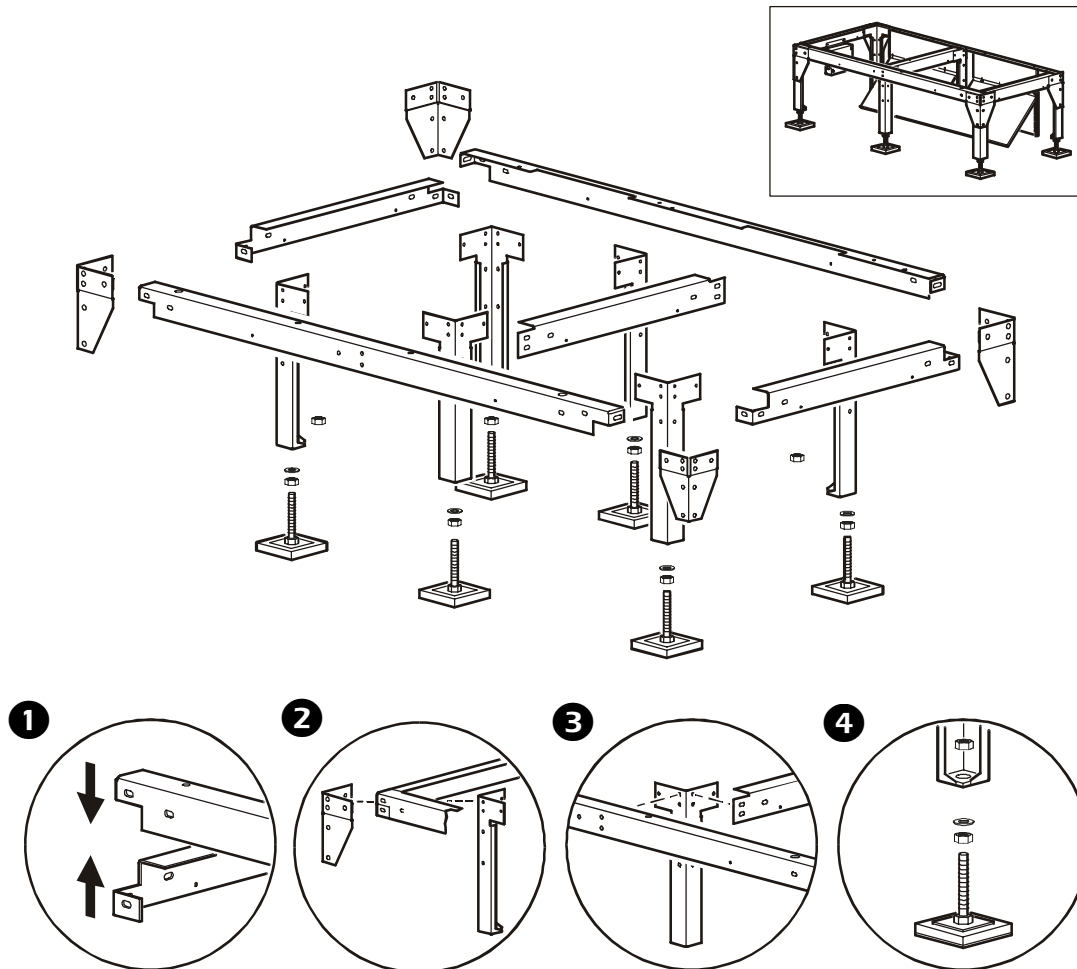
3. Reverse the above procedure when reinstalling.

Floorstands



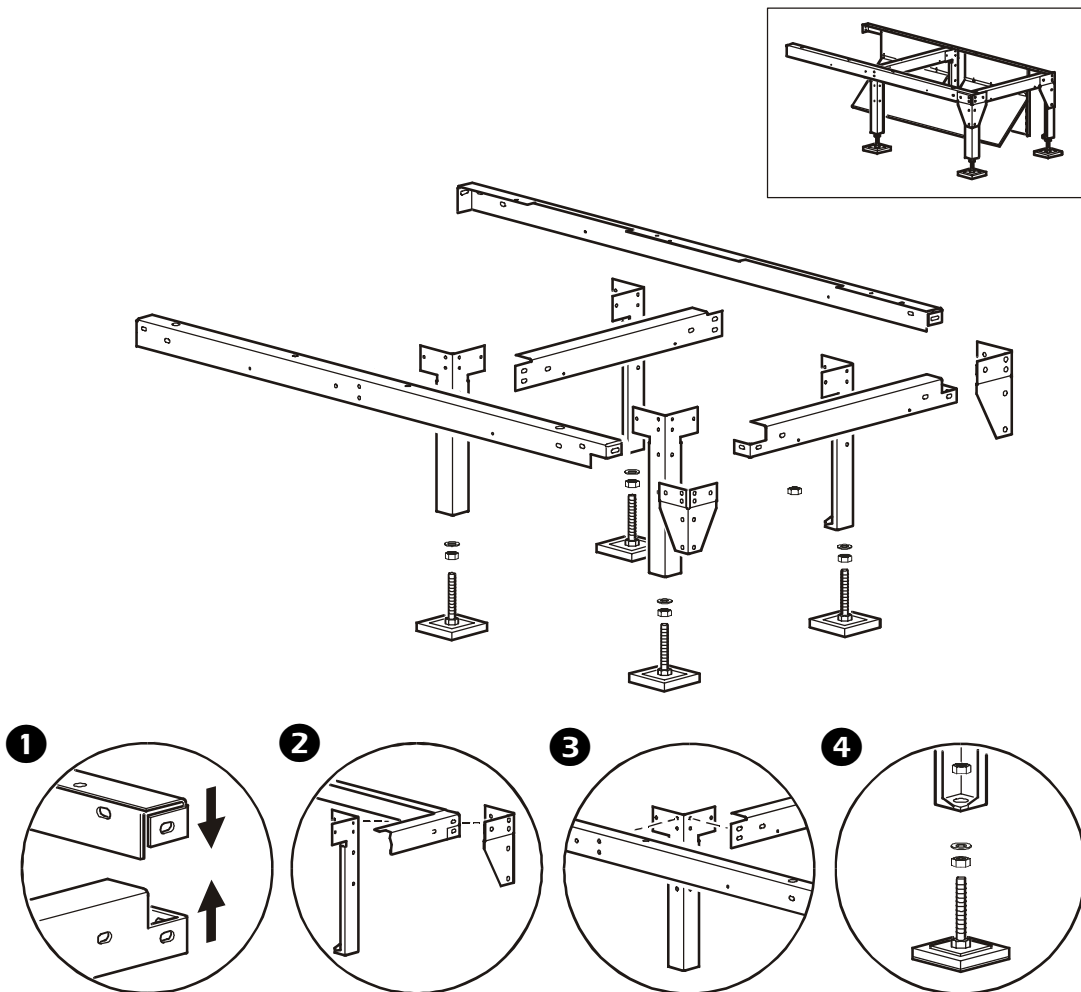
Floorstands are heavy. For safety, use at least two people when assembly and installing.

Assembling the Main Module floorstand



1. Position the front and side frame angles together to accept the leg assemblies and corners.
2. Mount the leg assemblies and corner brackets to the frame angles using six $\frac{5}{16}'' \times \frac{3}{4}''$ Allen flat-head screws and six $\frac{5}{16}''$ -18 serrated-flange nuts.
3. Attach the center cross member and front and rear center leg assemblies to the front and rear frame angles using six $\frac{5}{16}'' \times \frac{3}{4}''$ Allen flat-head screws and six $\frac{5}{16}''$ -18 serrated flange-nuts.
4. Insert the pedestal support assemblies into the bottom of each leg assembly, using one washer and two nuts.

Assembling the Expansion Module floorstand

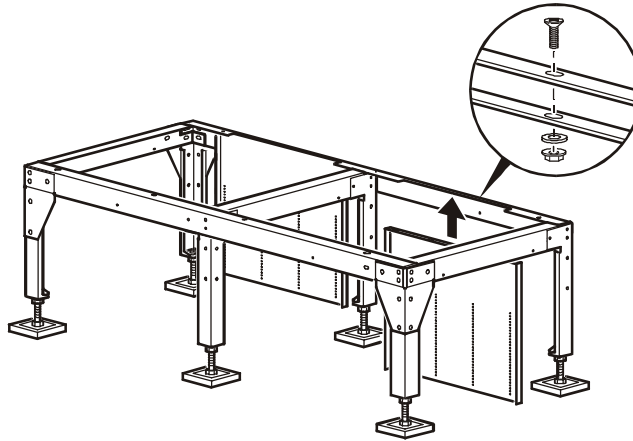


1. Position the front and side frame angles together to accept the leg assemblies and corners.
2. Mount the leg assemblies and corner brackets to the frame angles, using six $\frac{5}{16}$ " \times $\frac{3}{4}$ " Allen flat-head screws and six $\frac{5}{16}$ "-18 serrated-flange nuts.
3. Attach the center cross member and front and rear center leg assemblies to the front and rear frame angles using six $\frac{5}{16}$ " \times $\frac{3}{4}$ " Allen flat-head screws and six $\frac{5}{16}$ "-18 serrated-flange nuts.
4. Insert the pedestal support assemblies into the bottom of each leg assembly, using one washer and two nuts per leg assembly.

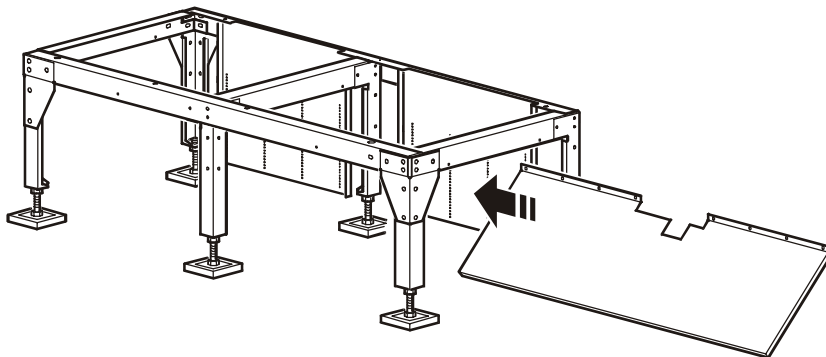
Installing the air diverter

All downflow units require an air diverter on both Main and Expansion Module stands.

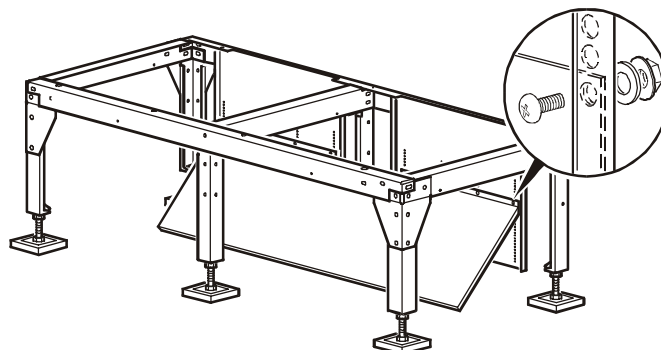
1. Attach the two air block panels to the rear of the stand, using the eight #8-32 \times 1/2" Phillips flat-head screws, flat washers, and #8-32 nylon lock hex nuts.



2. Slide the turning vane under the floorstand and position it against the air blocks.



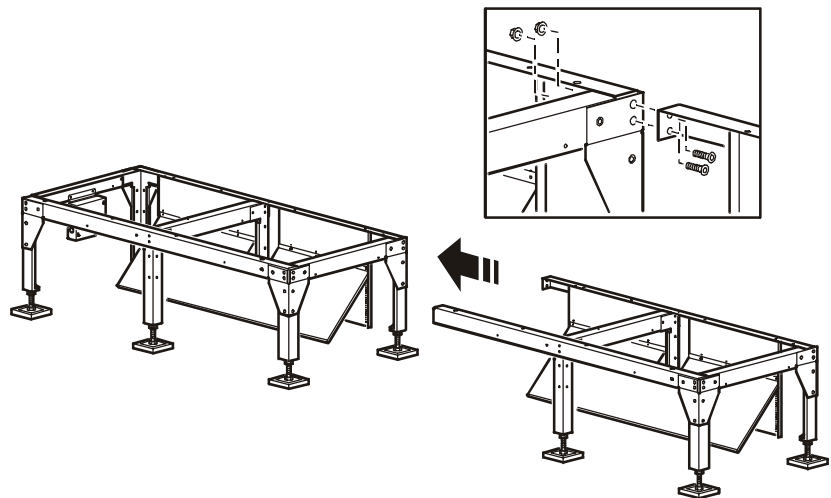
3. With the turning vane resting on the floor, align the eight holes of the turning vane with the eight holes of the air blocks, and attach it with eight #8-32 \times 1/2" Phillips pan-head screws, flat washers, and #8-32 nylon lock hex nuts.



Joining stands together

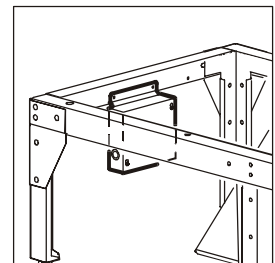
When joining Modules together, the floorstands (when required), must also be joined together.

1. Remove the four outer side 5/16" × 3/4" bolts and nuts used to secure the two side legs. (Depending on which side the expansion floorstand will be located, this may be either the left or right side.) Save these fasteners for step 3.
2. Position the Expansion Module stand next to the Main Module stand and align the four mounting holes.
3. Using the four bolts and nuts removed in step 1, attach the Expansion Module stand to the Main Module stand.



Electrical distribution box (optional)

Install the electrical box to the inner left angle frame of the Main Module stand. Only one electrical box is needed per System.



Seismic floorstand (optional)

In some areas, local codes require a seismic floorstand. If you are installing a seismic floorstand, refer to the installation procedures that come with the stand.

Installation

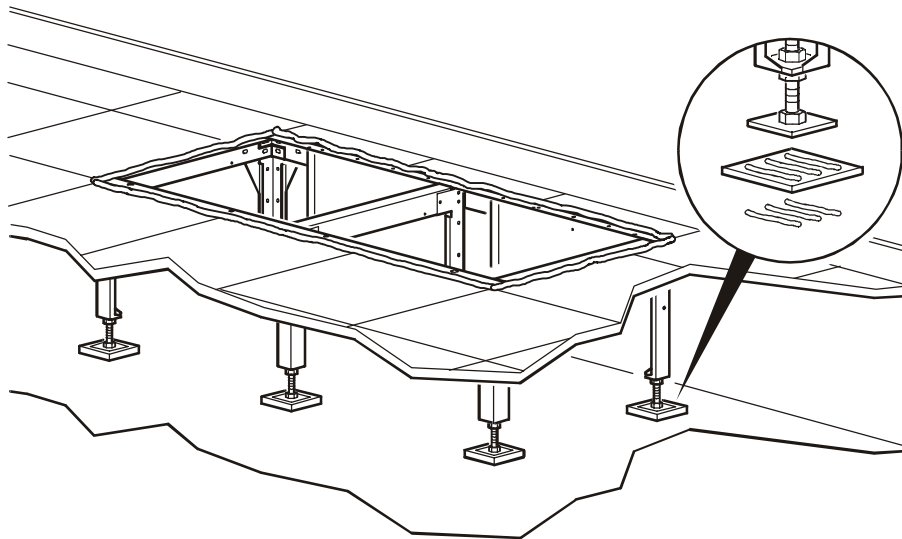


Caution

Provide adequate support to any modified raised-floor structures.

How to install the floorstand.

1. When using a floorstand with raised floors, remove or cut flooring to accommodate the floorstand.
2. Place the floorstand in the opening and position it on the pedestals.
3. Once it is in its final position, apply an adhesive between the pedestal and the pad, and between the pad and the sub-floor.
4. Using the adjustment nuts on the threaded pedestal legs, level the floorstand and make sure the top surface of the floorstand is 1/8 inch above the surface of the raised floor.
5. To prevent air leakage, seal all the way around the upper perimeter of the floorstand with a flexible airtight gasket or sealant.
6. If the floorstand is near a wall, ensure that the gap between the floorstand and the wall is sealed with flooring or another type of partition.



Sub-base

Installation

When determining the location for the sub-base, consider:

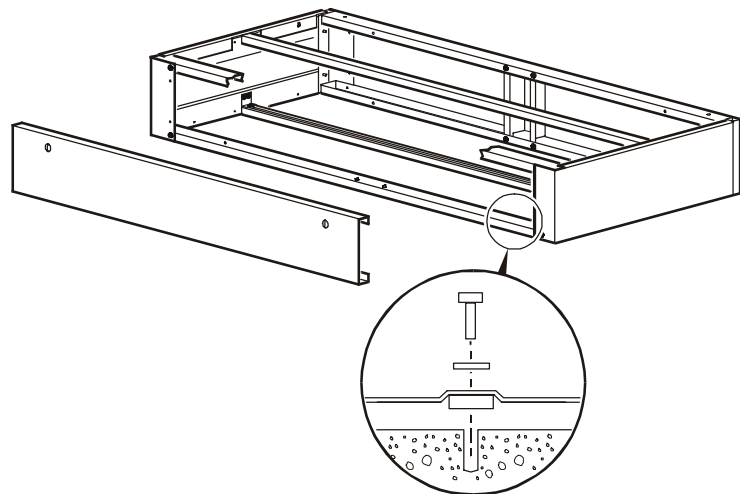
- Availability of a level floor that can support the weight of the Module.
- Location of utilities.



Note

To provide access to the mounting holes and utilities, both the front and rear panels can be removed by unlocking the two 1/4-turn fasteners located on each panel.

To install the sub-base. Mount the sub-base to the floor using six lag-bolts (or other approved fasteners). Shims may be used in areas where the floor is uneven.



Placing the Module

Rigging

The Module is manufactured with a formed steel frame for maximum strength and Module integrity. However, as with all electrical and mechanical equipment, care must be taken to properly rig the Module. When using a forklift to move the Module, use the shipping skid to protect the bottom of the Module. When using chains, cables, or rope to lift the Module, use spreader bars to prevent damage to the finished panel.



The Module has a high center of gravity. Use extreme caution when moving this Module.



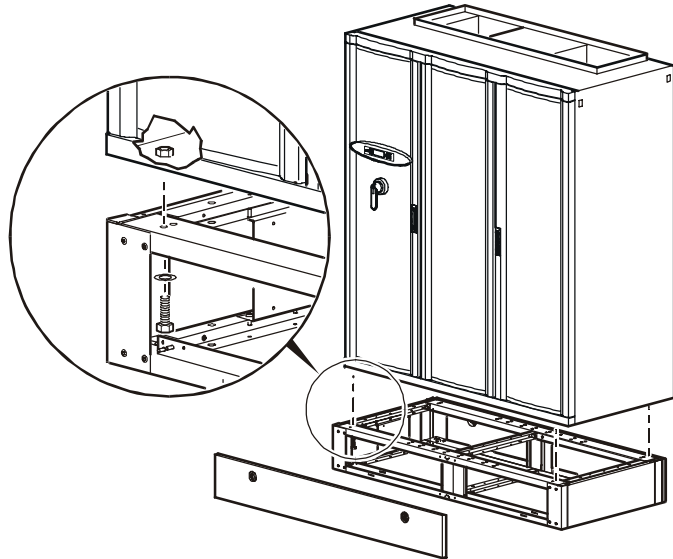
Do not attempt to move this Module without assistance.



When rigging, remove the exterior panels to prevent damage to the panels finish.

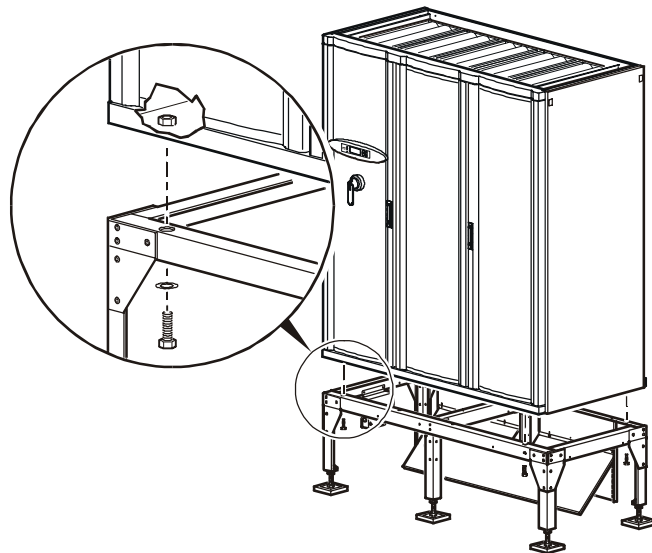
Place the Module on a sub-base (upflow only)

1. Place the Module on the sub-base and align the mounting nuts of the Module to the mounting holes of the sub-base.
2. Secure the Module to the sub-base using four washers (provided) and four M8 × 20 bolts, one at each corner. Use shims to level the Model, if necessary.



Place the Model on a floorstand

1. Place the Model on the floorstand and align the mounting nuts of the Model to the mounting holes of the floorstand.
2. From the bottom of the floorstand, secure the Model using four M8 × 20 bolts and washers, one at each corner.



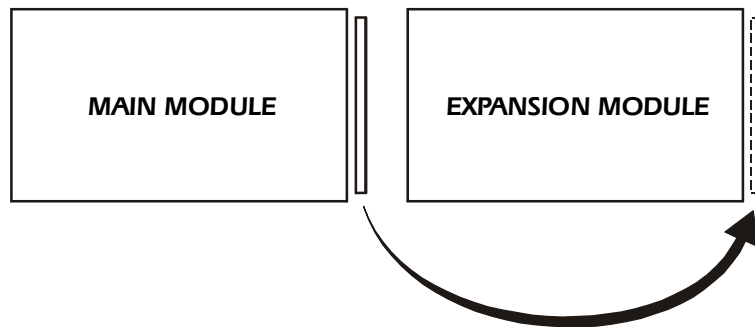
Joining Models together

When joining Modules together, Expansion Modules can be placed on either the left or right side of the Main Module. The following procedure shows how to join Modules to the right of the Main Module.

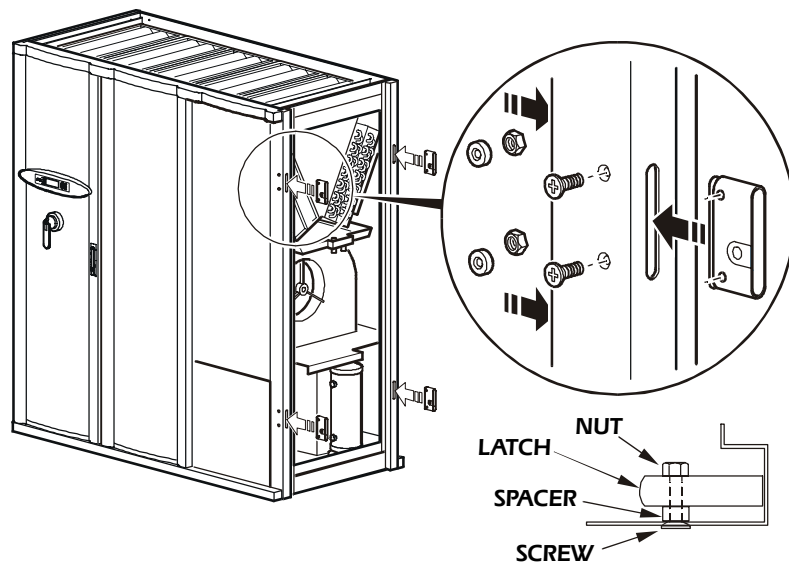


For instructions on how to remove the doors and panels, see “Removing the Doors and Panels” beginning on page 27.

1. Remove the side panel of the Main Module and relocate it to the side of the last Expansion Module at the end of the System.

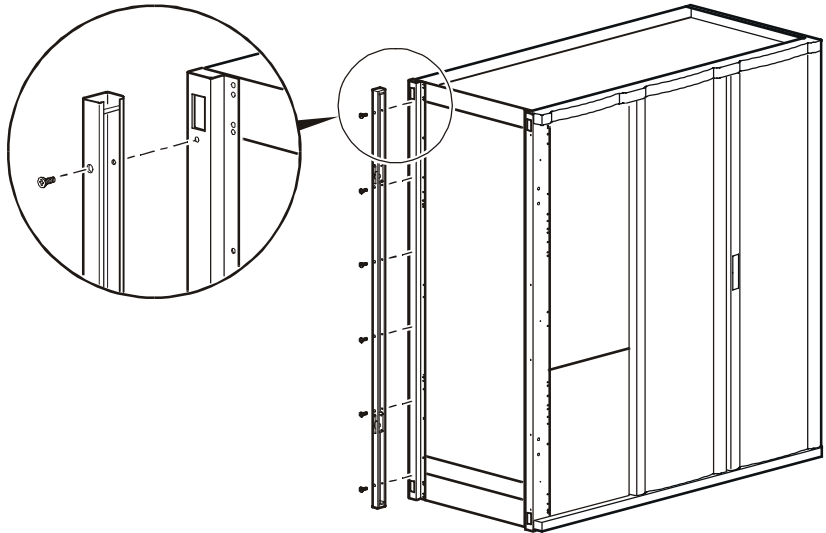


2. To expose the mounting holes for the latching mechanism, remove the right-front door, the left-rear panel, and the right-side air-block, on the Main Module.
3. Install four latches on the right side of the Main Module, using two screws, two nuts, and two spacers per latch (provided).

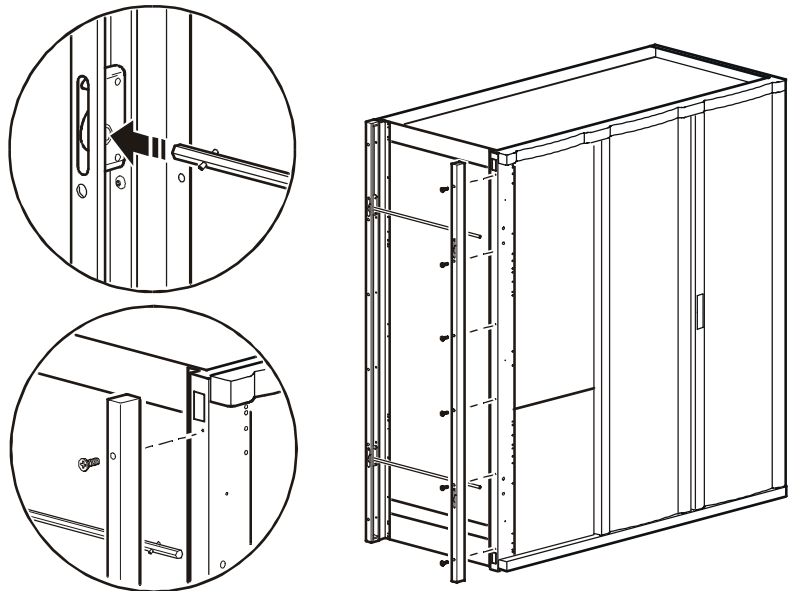


4. Remove the left-front door and left-rear panel of the Expansion Module.

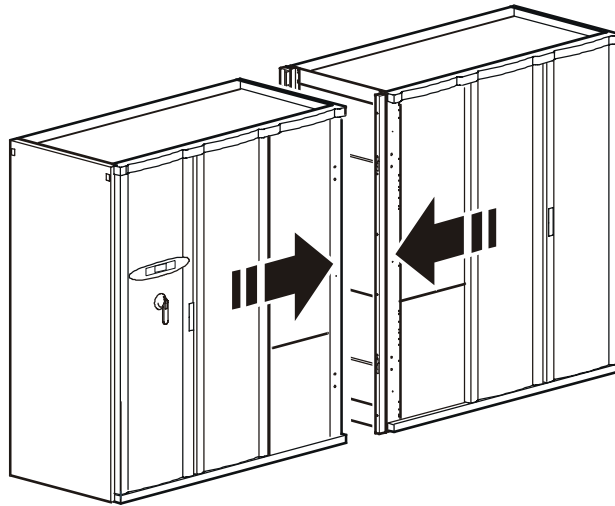
5. Attach the rear joining trim to the rear side of the Expansion Module, using six M6 Torx screws.



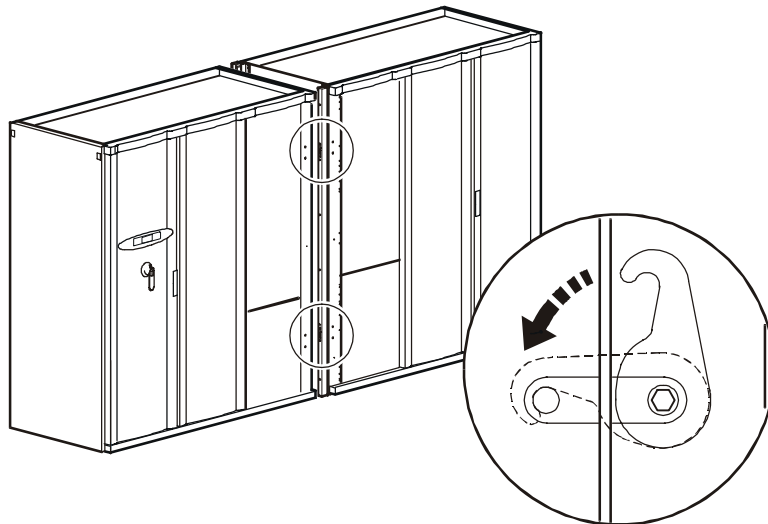
6. Insert a connecting rod into each of the latching mechanisms of the rear joining trim. Then, install the front joining trim onto the connecting rods and attach it to the front side of the Expansion Module, using six M6 Torx screws.



7. Position the Modules together and align the latching mechanisms of the Main Module with the latching mechanisms of the Expansion Module.



8. Using an 8-mm socket, latch the Modules together by turning the two latch hook assemblies, located in the joining trim, quarter-turn counterclockwise.



9. Reinstall the doors and rear panels on both Modules.

Heat Exchangers

Mount the heat exchanger on a level surface with sufficient strength to support its weight when fully charged. Use the mounting holes on the heat exchanger to prevent the Module from shifting during operation.

Before operation, ensure that all heat exchangers satisfy the following requirements:

- Incoming voltages match the nameplate listed on the heat exchanger.
- All set screws are secure.
- Fan blades turn freely, do not wobble, and are not distorted.
- Fan blades rotate in the proper direction.

Provide a main power disconnect to isolate the heat exchanger during routine service or an emergency.



See also

Refer to the heat exchanger manufacturer's installation, operation, and maintenance manuals for proper installation procedures.

Flooded Receiver

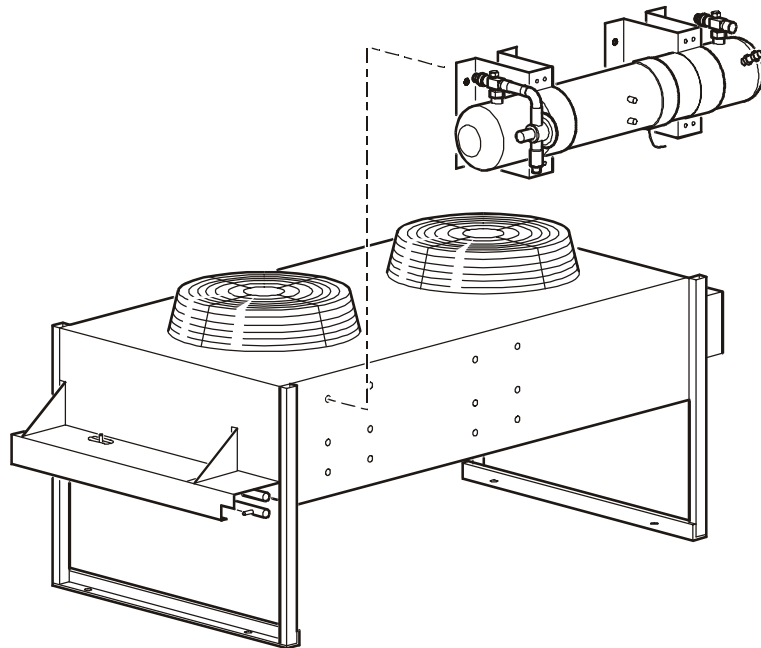
Installing the flooded receiver

To install the flooded receiver to the side of the heat exchanger:

1. Locate the dimples located on the side of the heat exchanger.
2. Position the flooded condenser on the side of the heat exchanger, aligning the eight holes of the mounting to the dimples.
3. Attach the flooded condenser to the side of the heat exchanger, using eight self-tapping screws (provided).



When making the plumbing connections, see “Piping Diagrams” beginning on page 15.



Pump Packages

The pump package is protected from the weather and has been factory-wired with pump and motor circuit breakers. Refer to the nameplate on the pump housing for electrical information and correct sizing. Your pump size may have been increased or decreased from the standard pump package because of pressure drop requirements.

Mount the pump package as close as possible to the drycooler. The glycol solution should flow from the drycooler to the pump package.

Dual-pump packages. Field-supplied check valves are required on the discharge of each pump. Use isolation valves in the piping design to facilitate the isolation of each pump in the case of pump failure and pump replacement while the condenser loop is in operation. All temperature control devices for the dry-cooler fans should be located on the fluid-out header of the dry-cooler (typically on a draw-through dry-cooler, the bottom header, or the header located at the air-intake side of the dry-cooler where the coolest air is pulled in). These temperature-sensing bulbs need to be insulated properly to prevent temperature influences from ambient or solar conditions. Dual pump packages will have a factory-supplied, field-installed flow switch used to activate the auto-change over function on dual pump packages. This flow switch needs to sense flow on the condenser loop supply coming from the pump's discharge.

Expansion Tank

Mount the expansion tank at the highest point in the piping system.
Provide a hose-bib for filling the system.



When plumbing the expansion tank, see “Piping Diagrams” beginning on page 15.

Mechanical Connections

Refrigeration piping

Discharge lines are sized such that velocity in the line is between 1,000 and 3,000 ft/min. The refrigerant velocity must be high enough to keep oil entrained in the flow. If the refrigerant velocity is too high, both the noise level and pressure drop will increase. The acceptable pressure drops in discharge lines are up to 10 psi.



Note

Consideration must be given to the loaded and unloaded state of the tandem compressors to assure that the operational range stays within these limits.

All refrigerant lines should be as short and direct as possible. Horizontal discharge and suction lines must be pitched downward (minimum 1/2-inch per 10 feet) in the direction of flow to aid in oil return. Vertical discharge and suction lines should be trapped at approximately every 20 feet to ensure proper oil return. Suction lines should have a “P” trap at the base. This trap should be as shallow as possible and the horizontal section as short as possible. Traps are normally not necessary at the base of discharge lines; however, loop the line to the floor before running it vertically to prevent the drainage of oil back to the compressor during shutdown periods.

Insulation. Insulate discharge lines to protect personnel and to minimize condensation of refrigerant during off cycles. Insulate suction lines so that gas returning to the compressor stays sufficiently superheated. It is not necessary to insulate liquid lines, unless you are using a flooded condenser package, where high ambient temperatures could decrease subcooling before liquid reaches the expansion valve.

Air-cooled Modules. The Module must be connected to a condenser—either a remote outdoor condenser, indoor centrifugal condenser, or outdoor condensing Module. Systems with remote outdoor or indoor centrifugal condensers must have suction and liquid lines from the indoor Module to the condenser. Systems with outdoor condensing Modules must have suction and discharge lines from the indoor Module to the condensing Module. Run all refrigerant lines in accordance with applicable industry guidelines.



To size lines, see “Recommended line sizes” beginning on page 48.

Calculate an equivalent length based on the actual linear length of the run, including valves and fittings. All fittings should be long-radius to minimize pressure drop.

Length of common valves and fittings

Pipe size, OD (in.)	Globe valve (ft)	Angle valve	Short radius ell	Long radius ell	Tee line flow and sight glass	Tee branch flow
1/2"	70.0	24.0	4.7	3.2	1.7	6.6
5/8"	72.0	25.0	5.7	3.9	2.3	8.2
3/4"	75.0	25.0	6.5	4.5	2.9	9.7
7/8"	78.0	28.0	7.8	5.3	3.7	12.0
1-1/8"	87.0	29.0	2.7	1.9	2.5	8.0
1-3/8"	102.0	33.0	3.2	2.2	2.7	10.0
1-5/8"	115.0	34.0	3.8	2.6	3.0	12.0
2-1/8"	141.0	39.0	5.2	3.4	3.8	16.0
2-5/8"	159.0	44.0	6.5	4.2	4.6	20.0
3-1/8"	185.0	53.0	8.0	5.1	5.4	25.0
3-5/8"	216.0	66.0	10.0	6.3	6.6	30.0
4-1/8"	248.0	76.0	12.0	7.3	7.3	35.0
5-1/8"	292.0	96.0	14.0	8.8	7.9	42.0
6-1/8"	346.0	119.0	17.0	10.0	9.3	50.0

* Equivalent pressure drop.

Recommended line sizes

	Model	FM 35	FM 40	FM 50
50 (15)	Discharge line (horizontal)	1-1/8"	1-1/8"	1-3/8"
	Liquid line	7/8"	7/8"	7/8"
	Discharge (vertical)	7/8"	7/8"	7/8"
	Flooded condenser to receiver	1-1/8"	1-1/8"	1-1/8"
100 (30)	Discharge line (horizontal)	1-3/8"	1-3/8"	1-3/8"
	Liquid line	7/8"	7/8"	7/8"
	Discharge (vertical)	7/8"	7/8"	7/8"
	Flooded condenser to receiver	1-1/8"	1-1/8"	1-1/8"
150 (46)	Discharge line (horizontal)	1-3/8"	1-3/8"	1-5/8"
	Liquid line	7/8"	7/8"	1-1/8"
	Discharge (vertical)	7/8"	7/8"	7/8"
	Flooded condenser to receiver	1-1/8"	1-1/8"	1-1/8"
200 (61)	Discharge line (horizontal)	1-3/8"	1-3/8"	1-5/8"
	Liquid line	7/8"	7/8"	1-1/8"
	Discharge (vertical)	7/8"	7/8"	7/8"
	Flooded condenser to receiver	1-1/8"	1-1/8"	1-1/8"

* Measurements shown in feet (meters).

Water/glycol

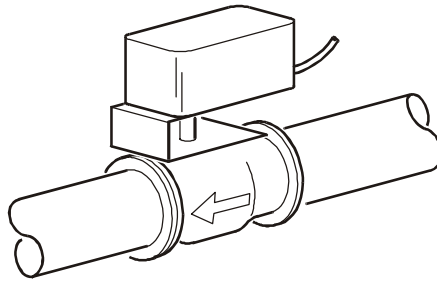
Exercise care when identifying the inlets and outlets of the glycol/water-cooled components. Install isolation valves and circuit flows as necessary to facilitate proper servicing and flow control for the respective Modules.

Economizer Automatic Coolant Isolation Valve (optional)

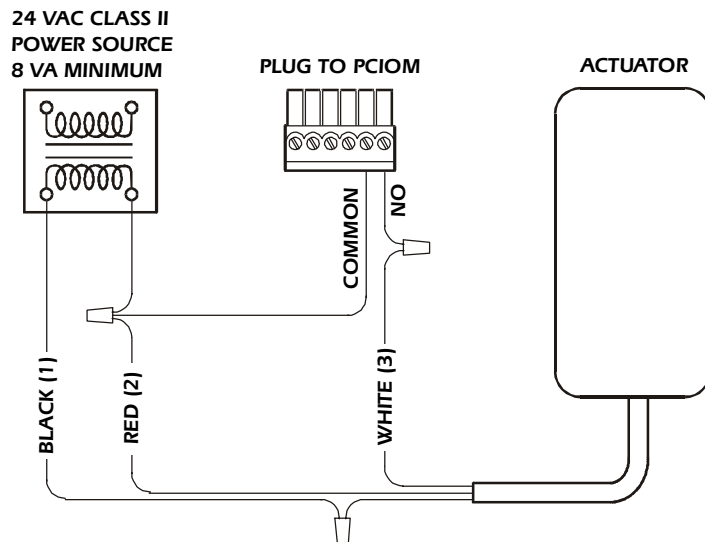
The automatic coolant isolation valve is an external two-position ball valve used to isolate the coolant flow to the FM Precision Air Conditioner.

To install the isolation valve:

1. Shut off and drain the coolant from the air conditioner prior to the installation of the ball valve.
2. Make sure that the piping can support the weight of the ball valve. Install additional support as needed.



3. Install the isolation valve between the coolant system-service shut-off valve and the coolant-supply connection to the air conditioner.
4. Wire the actuator to a Class II power source. Refer to the wiring diagram below for the wiring connections.



See also

To map the isolation valve to the PCIOM relay, see the Operation, Maintenance, and Troubleshooting Manual for the NetworkAIR FM Precision Air Conditioner.

Condensate pump

The condensate pump is a standard option on NetworkAIR FM Precision Air Conditioning equipment. The pump is factory-wired and piped internally to the condensate pan and humidifier discharge. The pump has a maximum lift of 90 feet of head. The condensate line connection is 7/8 O.D. pipe, which should be connected to an open drain. The pump has its own internal check valve to prevent the pump from short cycling. Use gcode-compliant piping practices when installing the condensate drain line to the open drain. The pump also uses an on-board condensate high level float switch, which is wired into the Module's alarm input for local and remote alarm capabilities.

Piping connections

Air-cooled. When piping air-cooled systems, be sure to use only clean refrigerant grade (Type L) pipe and follow standard procedures for pipe size selection. The maximum recommended distance between the evaporator and condenser is 200 equivalent feet. For any runs beyond this distance, contact the factory for assistance. Vertical runs (hot gas) require a trap every 20 feet of rise.



Note

When brazing copper field-installed refrigeration lines, use a nitrogen purge to minimize accumulation or scale during the brazing process.

The air-cooled system has been dehydrated at the factory and is shipped with a holding charge of nitrogen. Test refrigerant connections for leaks before charging the system with refrigerant. Pressurize the complete system with a trace amount of R-22 refrigerant and then pressurize to 250 psi with dry nitrogen, pressurize the system again to 250 psi to double-check all joints. After performing the leak check, use a vacuum pump to evacuate the total system. Pull a vacuum on the total system of 29 inches or 300 microns and hold it for four hours. Then, break the vacuum with dry refrigerant. At this point, the system can be fully charged.

Water/glycol-cooled. Do not route piping where it will interfere with the air discharge. Install shutoff valves for routine service and emergency isolation of the Module.

Humidifier. The humidifier water supply connection is a 1/4-inch compression fitting (supplied with the Module). Water pressure should be between 30 and 85 psi for proper humidifier operation. Extremely dirty water must be filtered before it is introduced into the humidifier. Do not use hot, softened, demineralized, or deionized water.



See also

Refer to the manual included with the humidifier cylinder for more information and troubleshooting procedures.

Drain. The 7/8-inch O.D. condensate drain connection routes condensate from the evaporator drain pan and humidifier drain.

Electrical Connections

The electrical connections required in the field are:

- Controls
- OHE (Outdoor Heat Exchanger)
- PCIOM
- Communication
- Main power



See also

Refer to the electrical schematic supplied with the Module for all electrical connections.

All electrical connections must be in accordance with national and local codes. Refer to the Module nameplate for voltage and current requirements. A power disconnect is required to isolate each Module for maintenance and service.

All low-voltage connections, including data and control connections, must be made with properly insulated wires. The low voltage connections must have 300 V insulation for 208/230 V Modules, and 600 V insulation for 460/480 V and 575 V Modules.

All refrigeration control wiring must be installed in accordance with the National Electrical Code (NEC) Class 2 circuit. A Class 1 circuit is required for water/glycol Modules.



Potentially dangerous and lethal voltages exist within this Module. More than one disconnect switch may be required to energize or de-energize this equipment. Observe all cautions and warnings. Failure to do so could result in serious injury or death. Only qualified service and maintenance personnel should attempt to work on this equipment.



Use a voltmeter to ensure that power is turned off before making any electrical connections.

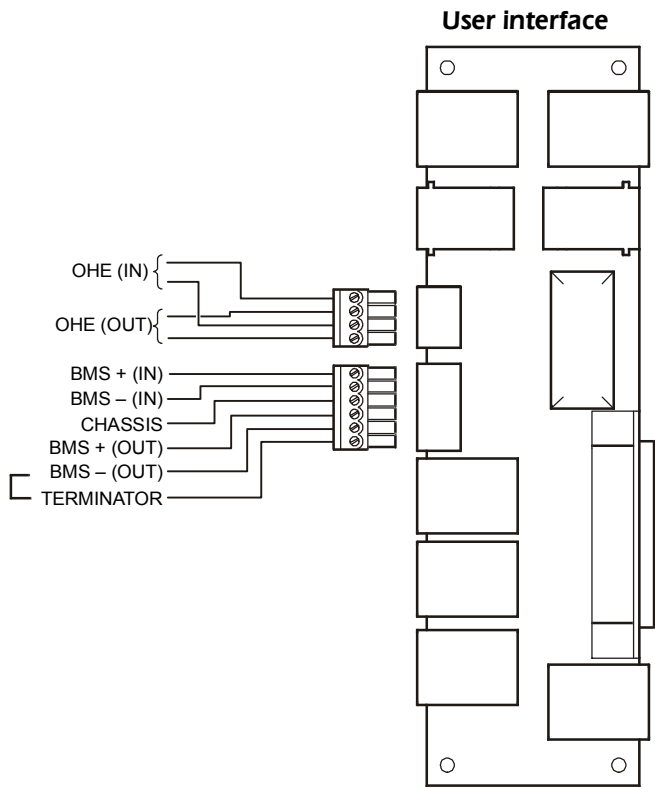
Control connections

Depending on the Module configuration, additional control connections may be required for the CAN Bus, redundant Module wiring, remote communications through APC Network Management Card support, or traditional equipment-monitoring software.

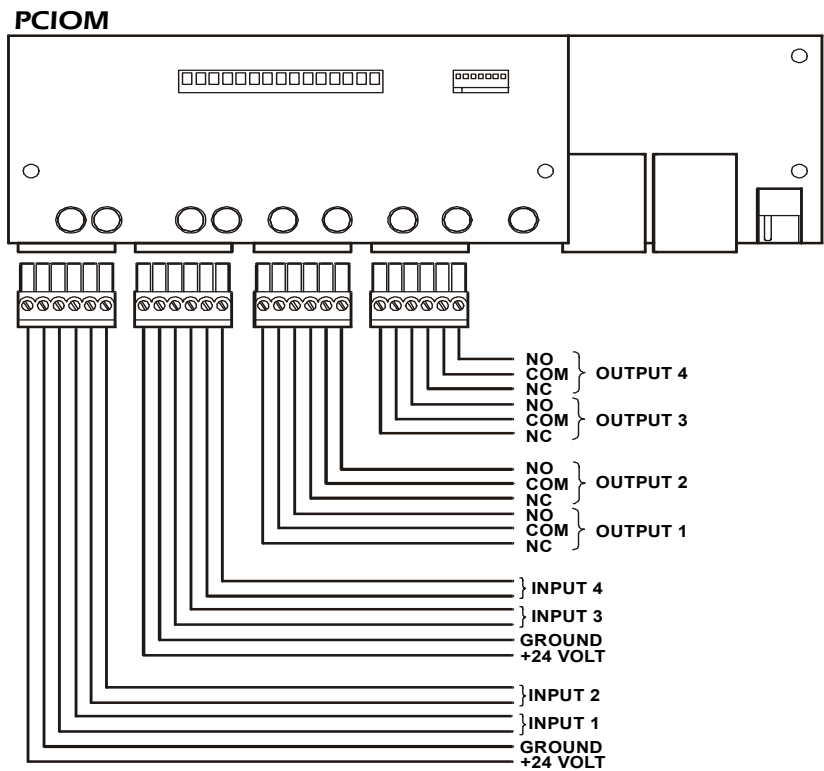
The control connections consist of:

- OHE (outdoor heat exchanger)
- input/output Modules

Wiring the Outdoor Heat Exchanger connections



Wiring the input and output connections—PCIOM



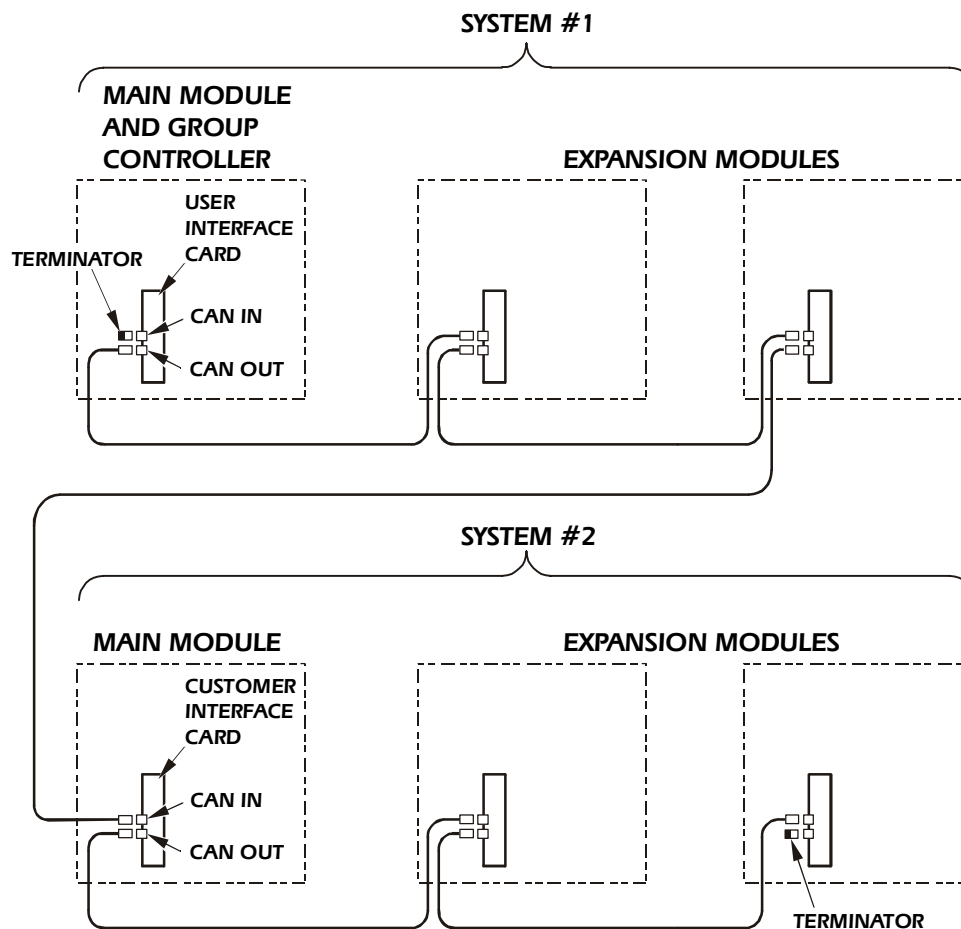
Communication connections

The communication connections consist of:

- MOD bus
- CAN (Controller Area Network)
- Telco
- Ethernet

CAN connections. The CAN connection allows micro-controllers to communicate with one another. Each Module has a user-definable address that distinguishes one Module from another and identifies Main Modules and Group Controller Modules.

Connecting the CAN network. Each Module contains a user interface card. To enable the Modules to work as a Group and/or System, link each of the user interface cards, using the supplied cables or CAT 5 cables with RJ-45 connectors. A terminator is required at the CAN IN connector in the Main Module and the CAN OUT connector in the last Module in the System or Group.



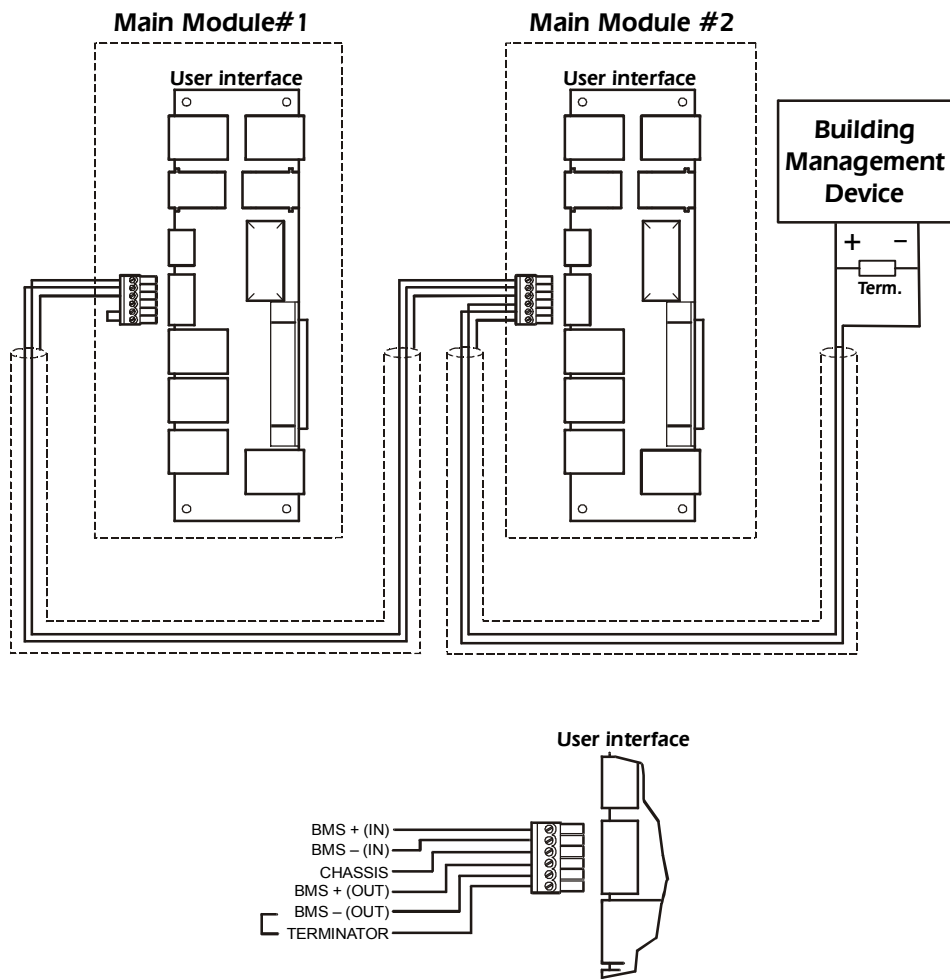
Assigning the CAN address. Assign the CAN address by setting the DIP switches located on the controller board in the electrical box. Refer to the chart below for proper DIP switch configuration settings.

DIP switch configuration

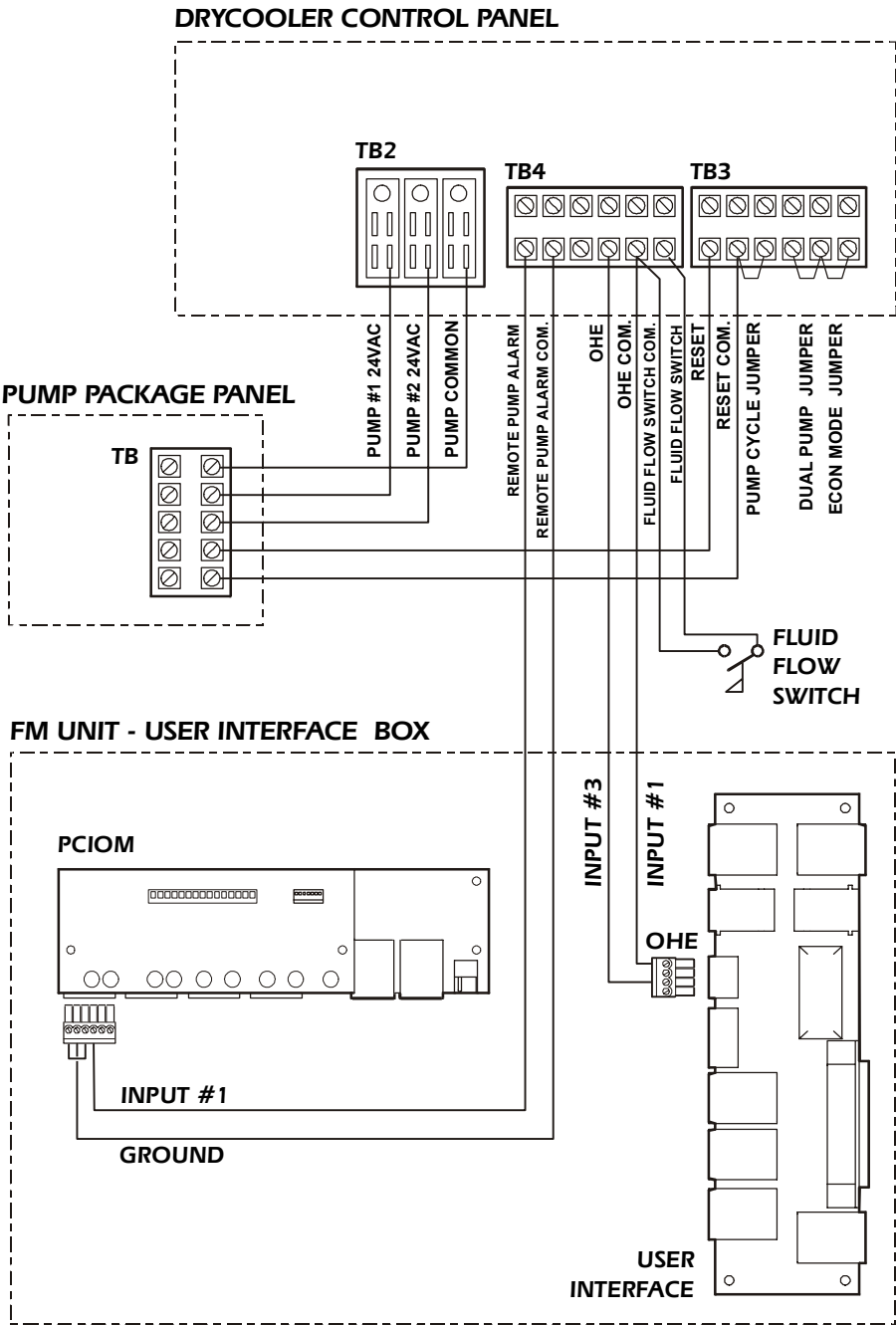
System number	Module	Switch number and position			
		1	2	3	4
1	Main Module and Group master	Off	Off	Off	Off
1	Expansion Module 1	Off	Off	Off	On
1	Expansion Module 2	Off	Off	On	Off
2	Main Module	Off	On	Off	Off
2	Expansion Module 1	Off	On	Off	On
2	Expansion Module 2	Off	On	On	Off
3	Main Module	On	Off	Off	Off
3	Expansion Module 1	On	Off	Off	On
3	Expansion Module 2	On	Off	On	Off
4	Main Module	On	On	Off	Off
4	Expansion Module 1	On	On	Off	On
4	Expansion Module 2	On	On	On	Off

Note: In order for the System to function properly, Expansion Modules must be assigned in increasing order as Expansion Modules are added.

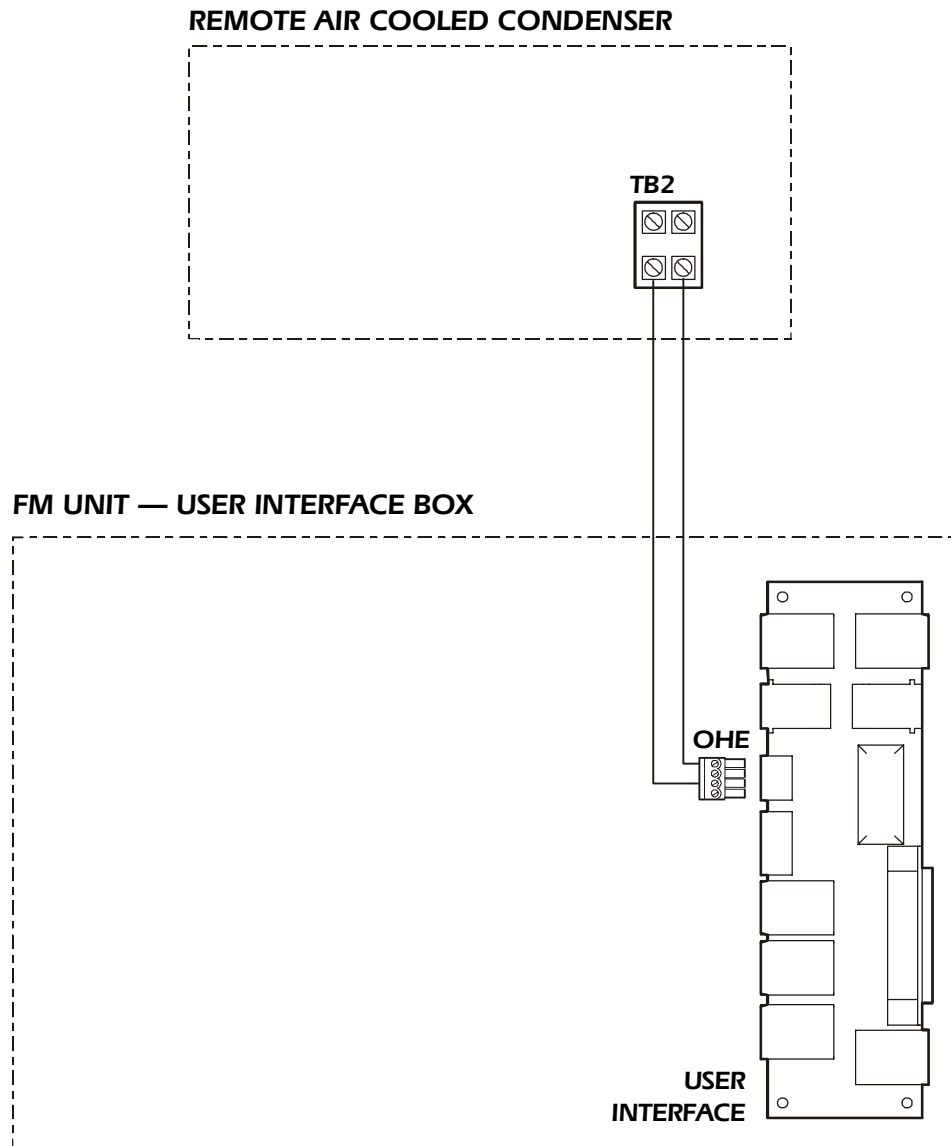
Wiring the Building Management System connections



Glycol system electrical connections



Remote condenser electrical connections



Main power connections

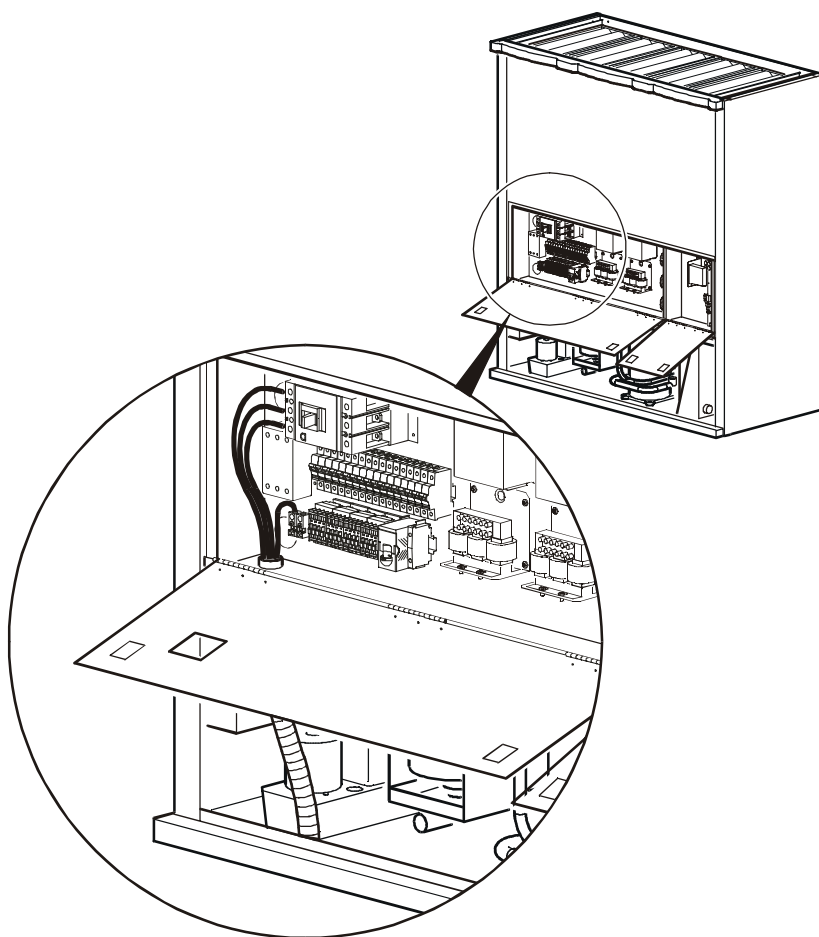


Note

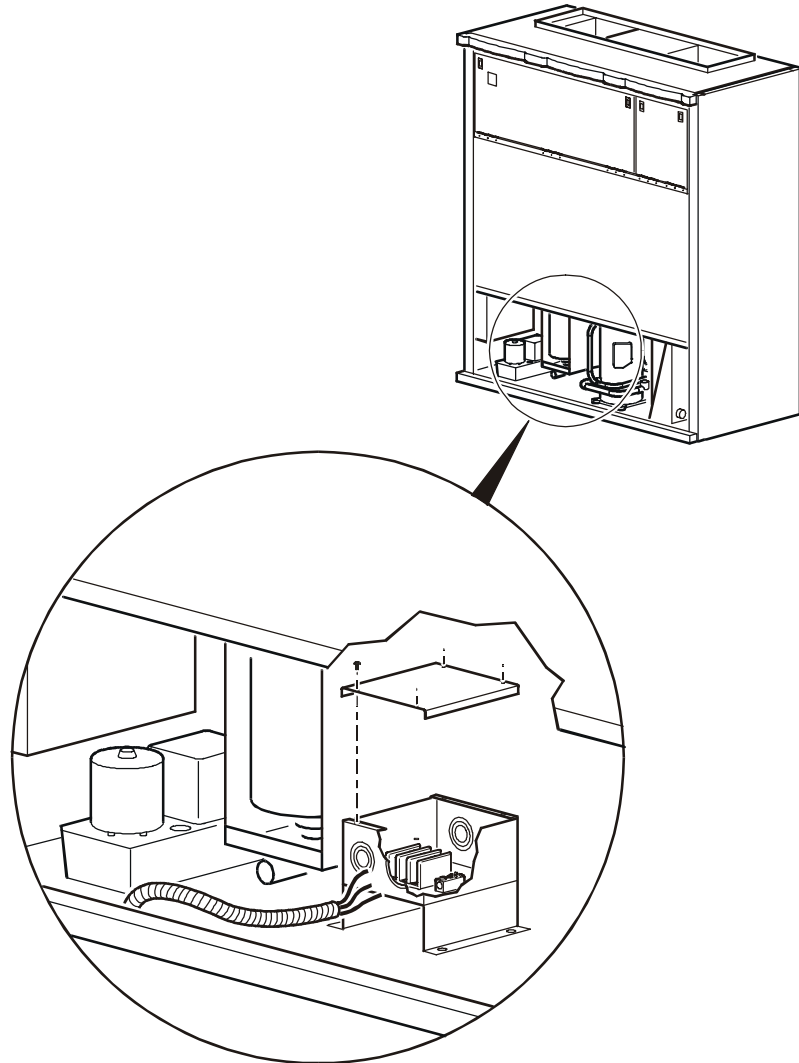
Three-phase electrical service is required. Electrical service must conform to national and local electrical codes. The Module must be grounded to an earth ground.

Check the Module's nomenclature for correct minimum circuit ampacity (MCA) and maximum fuse size (MFS).

Downflow Modules. Run three-phase electrical service from the bottom left of the Module and into the access holes provided in the bottom-left side of the electrical control box. Terminate the conduit at the electrical box. Connect power cables to the main circuit breaker and ground lug.



Upflow Modules. Run three-phase electrical service from the bottom left of the Module and into the junction box located in the bottom of the Module. Terminate the conduit at the junction box. Connect power cables to the terminal block and ground lug.



Plenums and Ducting

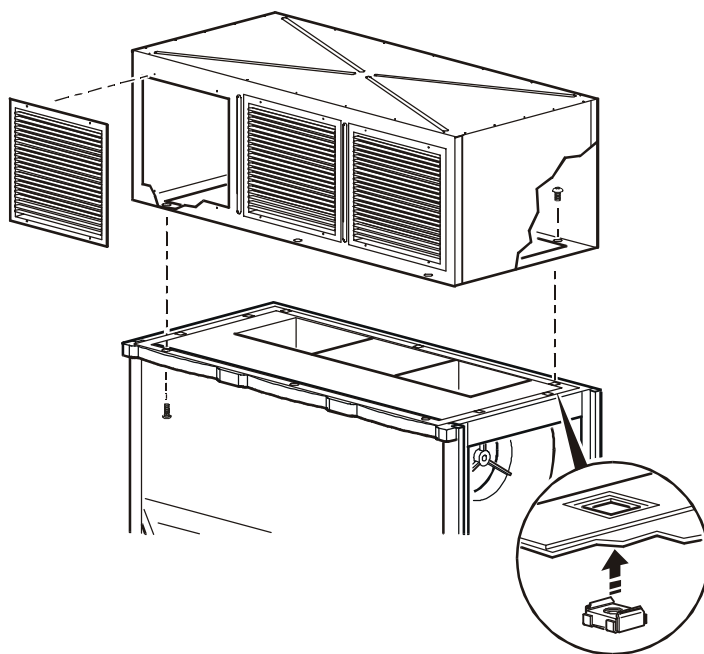
Installing the plenum

To install the discharge plenum on an upflow Module:



Refer to “Removing the Doors and Panels” beginning on page 27 to gain access to the inside of the Module.

1. Install caged nuts in the underside of the Module’s top panel.
2. Remove the louvers from the plenum.
3. Install gasket material to the top of the Module. Cut out areas to allow access to the caged nuts.
4. Place the plenum on top of the Module and align the mounting holes.
5. From the inside of the plenum, install seven M6 × 12 screws into the caged nuts on the rear and side mounting holes.
6. Install three M6 × 12 screws through the bottom of the fascia and into the three front mounting holes of the plenum.
7. Reinstall the louvers.

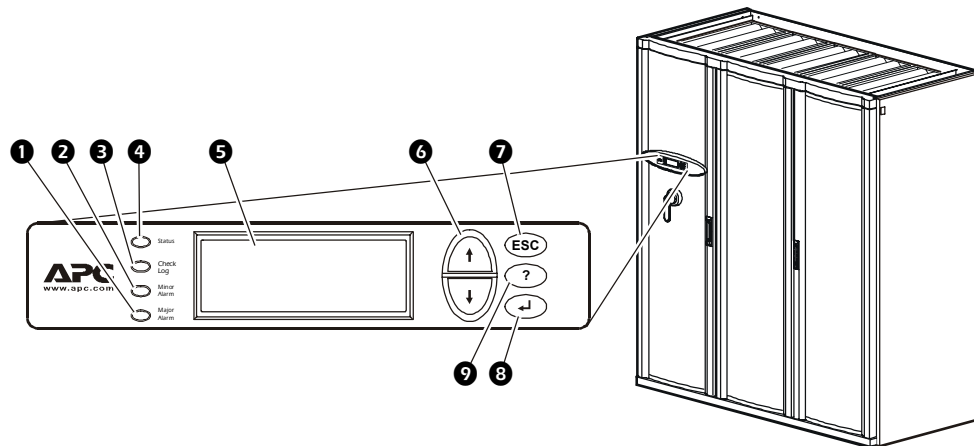


Ducting

Ducted discharge. A discharge plenum is provided without air grilles for Modules that are connected to a duct supply distribution system. The ducted discharge plenum is also shipped separately from the Module. Installation for this Module is the same as for a free-discharge Module.

Startup and Commissioning

Display Interface



Item	Function
➊ Major Alarm LED	When red, a major alarm condition exists.
➋ Minor Alarm LED	When yellow, a minor alarm condition exists.
➌ Check Log LED	When yellow, at least one new major alarm or minor alarm or event has occurred.
➍ Status LED	When green, the System is on.
➎ Liquid Crystal Display (LCD)	View alarms, status data, instructional help, and configuration items.
➏ Up and down arrow keys	Select menu items and access information.
➐ ESC key	Return to previous screen.
➑ Enter key	Open menu items and input changes to system and module settings.
➒ Help key	Display context-sensitive help. Press the HELP key for information about each option on the screen and for instructions on how to perform tasks.

Using the Display

Factory default settings

All the NetworkAIR FM Precision Air Conditioning Unit settings are controlled through the display interface on the front of the Main Module for each system. The factory default temperature is set at 72° F in the cooling mode, and 68° F in the reheat mode. The default dead band is set at 2° F.



Note

The system does not begin operation immediately after start-up. A start-up delay prevents it from starting immediately after power is applied (allowing a staged restart of equipment in the room).

Start the system

Path: Main menu > On/Off.

To start the System, select the **On/Off** option on the main menu and change the setting to **On**. Changing this setting will make the system run according to the current settings under **Control Environment**.

Scrolling status screens

After start-up, the interface will display the firmware revision number. The display interface will then scroll automatically and continuously through seven screens of status information.

Status Screen Name	Status Info Displayed
Temp & Humidity	<ul style="list-style-type: none"> • Return Temp & Humidity • Remote Temp & Humidity (optional)
Cool Demands	<ul style="list-style-type: none"> • Cool Demand % NOTE: If you have a fluid coil, the fluid coil (Economizer or MultiCool) and DX demands will be split. • Dehumidify Demand % • Actual Output %
Reheat Demand	<ul style="list-style-type: none"> • Reheat Status: On/Off • Reheat Demand % (Electric SCR only)
Humidify Demand	<ul style="list-style-type: none"> • Humidify Demand % • Humidify Actual %
Active Alarms	<ul style="list-style-type: none"> • Alarm number • Module identifier • Alarm name
Setpoints	<ul style="list-style-type: none"> • Cool °C (or °F) • Reheat °C (or °F)
Setpoints	<ul style="list-style-type: none"> • Dehumidify % RH • Humidify % RH

Press the up or down arrow key to interrupt the automatic scrolling and view a specific status screen. To return to the status screens, press the ESC key from the main menu screen.

Main menu screen

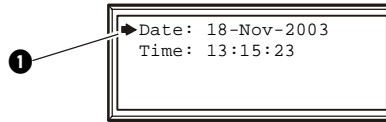
On any top-level status screen, press the ENTER or ESC key to open the main menu screen.

**Note**

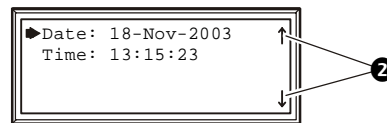
If the display interface is inactive for ten minutes, it will exit the menu and go back to the scrolling status screens. The length of this delay is determined by the **time-out** setting under the **Password** menu.

Navigate the interface

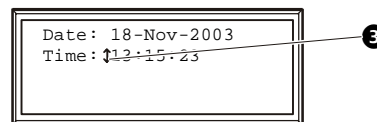
Selector arrows. To select a menu option or setting, press the up or down arrow key to move the selector arrow ❶ to the desired option or setting. Press the ENTER key to view the selected screen or modify the setting.



Continue arrows. Continue arrows ❷ indicate additional options or settings are available on a menu or status screen. Press the up or down arrow key to view the additional items.



Input arrows. Input arrows ❸ display next to a selected setting and indicate that the setting can be modified by pressing the up or down arrow key. Press the ENTER key to save the change or the ESC key to abort the change.



Change settings

To change a setting, use the up or down arrow key to move the selector arrow to the setting that you wish to change and press the ENTER key.

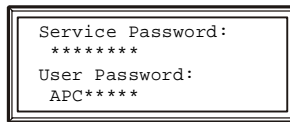
- **List of choices.** If the setting is a list of choices, an input arrow is displayed next to the setting. Press the up or down arrow key to select the choice you want and then press the ENTER key to exit the input mode and save the setting. Press the ESC key to exit without saving.
- **Numbers or text fields.** If the setting is a number or text field, use the arrow keys to select the value of the first character or digit and press the ENTER key to move to the next. Press the ENTER key after the last character or digit is set to exit the input mode and save the setting. Press the ESC key to exit without saving.

Password entry

The System has two levels of password protection:

- **User Password** for users who need to change basic and environmental settings
- **Service password** for users who need to modify settings that control the components in the unit or change advanced options

When you try to change any of the settings, the display will prompt you to enter your password.



The default for both the user and service password is **APC** (upper case). To enter your password, use the up or down arrow keys to scroll through the alphabet. When you reach the desired letter, press the

ENTER key and the cursor will move to the next letter position. After entering the last letter of your password, press the ENTER key once more to submit your password.



Note

Passwords are case-sensitive.

Stop the System

Path: Main menu > On/Off.

To stop the System, select the **On/Off** option on the main menu and change the setting to **Off**.



Note

Change the setting to **Off** to shut down all modes of operation and the blower fan; the display and the controller will remain powered.

For Systems with electric reheat, the blower fans may continue to operate for up to 60 seconds to purge the heat from the system.

Commissioning

After the FM Precision Air Conditioner is installed, verify that all components are working properly and that the module is ready to begin operation. To commission the module, the following inspections need to be completed:

- Initial
- Electrical
- Mechanical/refrigeration
 - Air-cooled
 - Water/glycol-cooled
 - MultiCool
- User interface box

After these inspections are complete, the module is ready for the functional test and charging. Complete the following procedures to begin operation of the module:

- Functional test
- Module charging

Complete the following two checklists and the module is ready to begin normal operation:

- Start-up
- Final



Equipment must be properly de-energized and locked-out prior to performing any service on this equipment.

Review the MSDS sheets (R-22) for safe handling of the refrigerant.

The module operates under pressure (40-425 psi). Take proper safety precautions when connecting gauges or servicing the refrigerant/condenser loop or chilled water piping.

Initial inspection

The initial inspection ensures that the module has been securely mounted to the floor stand or sub-base and that the air distribution system is properly installed. The room must be sealed with a vapor barrier and the module must be free of damage.



To perform the inspection, see “Initial Inspection Checklist” on page 75.



Do not run service utilities in front of the blower outlets.



The vapor barrier minimizes moisture infiltration. Without a vapor barrier, your module will have difficulty maintaining the humidity in the room.

Do not introduce unconditioned outside air into the space.



Thirty-six inches of clear floor space in front of the module is required for service access.

Electrical inspection

The electrical inspection verifies that all electrical connections are secure and correct and that the module is properly grounded.



To perform the inspection, see “Electrical Inspection Checklist” on page 77.



All electrical wiring must comply with NEC and local codes.

The module must be grounded to an earth ground (do not use a water-pipe ground).

Three-phase electrical service is required.

Mechanical/ refrigeration inspection

There are three distinct mechanical/refrigeration inspections corresponding to the different heat of rejection methods:

- Air-cooled
- Water/Glycol-cooled
- MultiCool

Perform the appropriate inspection for your configuration.



See “Mechanical/Refrigeration Inspection Checklist” on page 79.

Air-cooled. The air-cooled mechanical inspection ensures that air-cooled systems are ready for start-up and module charging. The inspection ensures that field piping is properly installed to promote oil return to the compressors.



To perform the inspection, see “Mechanical Inspection: Air-cooled Checklist” on page 81.



Caution

Do not block air distribution (blower vents) with field installed piping.

Failure to properly install piping and traps may result in improper module operation and poor oil return through the refrigerant piping system.

Water/glycol Modules. The water/glycol-cooled mechanical inspection ensures that field piping is properly installed, including: sensor bulb installation, sensor bulb placement, and proper piping sizes. The system is checked for leaks, air in the system, and proper installation of the pump package and expansion tank.



To perform the inspection, see “Mechanical Inspection: Water/Glycol Checklist” on page 83.



Note

Modules with a dry cooler must have a means of allowing air to escape the system. Automatic bleed vents are preferred.

MultiCool. The MultiCool mechanical inspection ensures that modules with a MultiCool coil are properly connected to the building’s chilled water supply. The system must be checked for isolation valves, air in the system, and for adequate water temperature to provide cooling.



To perform the inspection, see “Mechanical Inspection: MultiCool Checklist” on page 85.

User interface box inspection

The user interface box inspection verifies that the module’s sensors and internal communications links are installed properly. Check that the outdoor heat exchanger is connected to the module and that it is linked to the other modules in the room (if you are using system and group controls).



To perform the inspection, see “User Interface Box Inspection Checklist” on page 87.

Functional test



The inside of the module must be free from debris before it is started.



Caution

Ensure that air filters are clean and in place.

1. Apply power to the module.
2. With the outer doors open and the center door removed to gain access to the electrical box components, check the voltage at the main power connection point. The voltage reading must match electrical rating on nameplate $\pm 10\%$. Record the line voltage on the site form.
3. Turn the main power circuit breaker to **On**.
4. Check the voltage of the controller power supply transformer; it has a voltage range of 25–30 VAC.
5. Check the voltage in the secondary control circuit of the other two transformers; they have a nominal voltage of 24 V. The voltages must be between 22.0 and 26.5 VAC.
6. Start the module using the display interface (**Main Menu > On/Off**). After three seconds, use the same command to stop the module. Verify the blower rotation.
7. Verify compressor rotation.
 - a. Temporarily engage the compressor (if tandem compressors are installed, you must do this for each one).
 - b. Verify that the high pressure gauge reading increases, the low pressure gauge reading decreases, and that the compressor does not make any unusual sounds.



Note

If the gauges read opposite the description above, or if the compressor begins making unusual noises, you must switch two of the three phases of power to the compressor at the electrical box.

8. Verify that the blower motor current is within the range specified on the nameplate.
9. Apply power to the condenser, dry cooler, and pump package and verify that the line voltage matches the module nameplate specifications. Record the voltage and confirm proper pump rotation.

System charging

Airflow. Verify that the airflow is within acceptable limits. On the display interface, follow the path: **Main Menu > Setup > Module > [Main or Expansion] Module > Module Control > Adjust Blower.** The differential pressure across the coil is displayed at the bottom of the screen. Adjust the blower frequency until the coil differential pressure is between the minimum and maximum values listed in the table below.

Coil Differential Pressure Values

Model	Std Dry	Min	Max	Alarm Clear	Airflow Alarm
FM 35	0.16	0.13	0.19	0.10	0.06
FM 40	0.23	0.19	0.28	0.15	0.08
FM 50	0.35	0.28	0.42	0.22	0.13
FM 35MC/EC	0.33	0.27	0.40	0.21	0.12
FM 40MC/EC	0.47	0.38	0.57	0.30	0.17
FM 50MC/EC	0.70	0.57	0.85	0.45	0.25

All values are displayed in inches water column ("WC)

Air-cooled modules. Refer to the chart below for the amount of refrigerant required for each module.

R-22 factory charge

Model	Charge (lbs)
FM 35	24.3
FM 40	24.8
FM 50	25.3

Water/glycol modules. Water/glycol modules are already charged with refrigerant. Perform a visual inspection of the refrigerant level at the sight glass with the module operating.



Note

There should be few or no bubbles in the refrigerant line while the module is operating.

Water/glycol physical data

Model	FM 35	FM 40	FM 50
Glycol	1.93	2.53	2.83
Water	1.32	1.46	1.76
Econ	8.43	9.03	9.33
Multi Cool	6.50	6.50	6.50
Unit Volume (gallons water)			

Start-up inspection

The start-up inspection ensures that the module is operating properly after its initial start-up. This inspection verifies that all modes of operation are working correctly and that module is ready for normal operation.



To perform the inspection, see “Start-up Inspection Checklist” on page 89.

Final inspection

The final inspection ensures that the system is ready to begin service. This inspection verifies that the system is clean, the installed options work properly, the setpoints and deadbands are set, and the start-up form is sent to APC.



To perform this inspection, see “Final Inspection Checklist” on page 91.

Checklists

Initial Inspection Checklist

Ensure that the:

- | | |
|--------------------------|--|
| <input type="checkbox"/> | Installation procedure is complete according to the installation manual. |
| <input type="checkbox"/> | Walls, floor, and ceiling are sealed with vapor barrier. |
| <input type="checkbox"/> | Raised floor space (downflow Modules only) beneath the Module is a minimum of 12 inches for Modules with capacities up to 50 KW (14 tons) and 18 inches for Modules with capacities over 50KW (14 tons). |
| <input type="checkbox"/> | Floor stands (downflow Modules only) are installed correctly and that the Modules are secured to them. |
| <input type="checkbox"/> | Sub-bases (upflow Modules only) are installed correctly and that the Modules are secured to them. |
| <input type="checkbox"/> | Duct work/plenums are properly installed. |
| <input type="checkbox"/> | Module shows no signs of damage. |
| <input type="checkbox"/> | Clearance around the system is in accordance with ASHRAE, local and national code, and the installation manual. |
| <input type="checkbox"/> | Shipped components (disconnect handles, leak detection devices, condensate pumps, thermostats, display, etc.) are installed securely in the Module. |



Warning

Equipment must be properly de-energized and locked-out prior to performing any service on this equipment.

Review the MSDS sheets (R-22) for safe handling of the refrigerant.

The Module operates under pressure (40–425 psi). Take proper safety precautions when connecting gauges or servicing the refrigerant/condenser loop or chilled water piping.

Never operate this Module with any cover, guard, door, or panel removed unless instructions indicate otherwise and do so with extreme caution.



Warning

Do not run service utilities in front of the blower outlets.



Caution

The vapor barrier minimizes moisture infiltration. Without a vapor barrier, your Module will have difficulty maintaining the humidity in the room.

Do not introduce unconditioned outside air into the space.

Electrical Inspection Checklist

Ensure that the:

- | | |
|--------------------------|--|
| <input type="checkbox"/> | Incoming voltages match the phase and voltage listing on the nameplate. |
| <input type="checkbox"/> | Module is properly grounded to an earth ground. |
| <input type="checkbox"/> | Internal electrical components and terminal blocks do not have any loose connections. |
| <input type="checkbox"/> | Electrical connections are tight, including: contactors, terminal blocks, circuit breakers, controllers, switches, relays, auxiliary devices, and field connections. |
| <input type="checkbox"/> | Circuit breakers are correct and securely attached to the DIN rail. |
| <input type="checkbox"/> | Interconnecting control wiring from the Module to the outdoor heat exchanger/pump is correct. |



All electrical wiring must comply with NEC and local codes.

The Module must be grounded to an earth ground (do not use a water-pipe ground).

Three-phase electrical service is required.

Mechanical/Refrigeration Inspection Checklist

Ensure that the:

-
- | | |
|--------------------------|---|
| <input type="checkbox"/> | Condenser/dry cooler fans and blowers are turning freely and that the blades are not distorted or bent. |
| <input type="checkbox"/> | Condensate drain line is at least the size of the drain connection. |
| <input type="checkbox"/> | Condensate drain line is pitched (1/8 inch per foot minimum) and properly trapped (4–5 inches). |
| <input type="checkbox"/> | Humidifier (if the Module is equipped with a humidifier) water-supply piping is connected and is the correct size. |
| <input type="checkbox"/> | NTC sensor is installed on the supply glycol/water lines. |
| <input type="checkbox"/> | NTC sensor is properly insulated on the supply glycol/water lines. |
| <input type="checkbox"/> | Mechanical connections are tight, including compressor roto-lock connections and the receiver roto-lock connections. Also check that the humidifier cylinders are seated on the fill/drain block. |
-

Mechanical Inspection: Air-cooled Checklist

Ensure that the:

- | | |
|--------------------------|---|
| <input type="checkbox"/> | Refrigerant piping size is correct, according to the line-size table in the installation manual. |
| <input type="checkbox"/> | Liquid, discharge, and suction lines vertical, horizontal, and total run lengths are recorded. |
| <input type="checkbox"/> | Number of 45- and 90-degree ells in the refrigerant piping are recorded. |
| <input type="checkbox"/> | Field-installed traps and piping are in accordance with the installation manual and follow proper piping practices. |
| <input type="checkbox"/> | Refrigerant piping is adequately supported and isolated when necessary. |
| <input type="checkbox"/> | Field-installed service valves are open. |
| <input type="checkbox"/> | Relief valves are installed in accordance with the installation manual. |
| <input type="checkbox"/> | Piping in the building and on the roof is properly insulated. |



Air-cooled Modules are shipped from the factory with a nitrogen holding charge and must be removed before any field piping is attempted. To remove the nitrogen holding charge, use the multiple Schrader valves located on the internal piping .



Do not block air distribution (blower vents) with field-installed piping.

Failure to properly install piping and traps may result in improper Module operation and poor oil return through the refrigerant piping system.

Mechanical Inspection: Water/Glycol Checklist

Ensure that the:

-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Field-installed service valves are open. |
| <input type="checkbox"/> | Air is bled from the water/glycol system. If air remains in the system, bleed it out now. |
| <input type="checkbox"/> | Ambient/discharge water/glycol sensing bulbs are properly insulated and not influenced by improper insulation or heat convection (sunlight). |
| <input type="checkbox"/> | Pump package and the expansion tank are installed in accordance with the installation manual. |
| <input type="checkbox"/> | Water/glycol piping size is recorded. |
| <input type="checkbox"/> | Glycol concentration is recorded. |
| <input type="checkbox"/> | Supply and return pump pressures are recorded. |
| <input type="checkbox"/> | Piping does not have any leaks. |
| <input type="checkbox"/> | Dry cooler aquastat sensor bulbs are installed, well insulated, and will not be affected by ambient temperature. |
| <input type="checkbox"/> | Piping in the building and on the roof is properly insulated. |
| <input type="checkbox"/> | Water/glycol flows through the Module. |
-

Mechanical Inspection: MultiCool Checklist

Ensure that the:

-
- ☐ External chilled water isolation valves are open.
 - ☐ Air is bled from the system. If air remains in the system, bleed it out now.
 - ☐ Piping does not have any leaks.
 - ☐ Supply water temperature is recorded.
-

User Interface Box Inspection Checklist

Ensure that the:

- | | |
|--------------------------|---|
| <input type="checkbox"/> | System CAN bus is connected to each System, Main Module, and Expansion Module. |
| <input type="checkbox"/> | OHE (outdoor heat exchanger) interlock is connected. |
| <input type="checkbox"/> | Input contacts and output relays are connected correctly. |
| <input type="checkbox"/> | Module CAN bus is connected to each PCIOM board. |
| <input type="checkbox"/> | Building management system RS-485 port is connected properly (if connecting to a building management system). |

Start-up Inspection Checklist

While the Module is operating, ensure that the:

-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Water/glycol condenser fluid valve is adjusted properly. |
|--------------------------|--|
-
- | | |
|--------------------------|---------------------------------------|
| <input type="checkbox"/> | Sight glass moisture sensor is green. |
|--------------------------|---------------------------------------|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Current draw of all blowers, heaters, compressors, humidifiers, transformers, and fans for each mode of operation (cool, reheat, dehumidify, humidify) are within their circuit breaker's ratings.
1. Record the current at the main power connection of the main circuit breaker.
2. Record all current draws on the load side of any circuit breakers used for each device.
3. Compare the circuit breaker setting for each device to the actual current measured and the full load amps of the device to verify that the current draws are acceptable. |
|--------------------------|--|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Condenser fluid valve actuator type is recorded (water and glycol cooled Modules). |
|--------------------------|--|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Compressor suction and discharge pressures are recorded. |
|--------------------------|--|
-
- | | |
|--------------------------|---|
| <input type="checkbox"/> | Superheat and sub-cooling pressures are recorded. |
|--------------------------|---|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Module is free from malfunctions, including refrigeration leaks, water leaks, unusual vibrations, or other irregularities in each mode of operation. |
|--------------------------|--|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Low pressure switch/pump-down solenoid is operating correctly.
1. Shut down the compressor.
2. Record the low-pressure shut off point with a manifold. |
|--------------------------|--|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | High-pressure switch is operating correctly.
1. Shut down the condenser.
2. The head-pressure will rise until the high-pressure switch shuts down the compressor.
3. Record the shut-off point. |
|--------------------------|--|
-
- | | |
|--------------------------|---|
| <input type="checkbox"/> | Cool, reheat, dehumidification, and humidification cycles engage. |
|--------------------------|---|
-
- | | |
|--------------------------|---|
| <input type="checkbox"/> | Coil fluid valve actuator operates correctly (MultiCool and Economizer Modules only). |
|--------------------------|---|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Hot gas bypass valves operate correctly.
1. Shut down the airflow across the evaporator to allow the pressure in the coil to fall.
2. The pressure will drop until it reaches the setting for the hot-gas bypass valve. The value should be between 55 and 58 psi.
3. Adjust the valve as necessary and record the pressure setpoint. |
|--------------------------|--|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Hot gas reheat solenoid/reversing valves work properly.
1. Set the dehumidification setpoint below the actual humidity in the space. (Be sure to account for the deadband.)
2. Once the Module starts the dehumidification mode, raise the temperature setpoint above the actual room temperature to activate the reheat solenoid/reversing valve. |
|--------------------------|--|
-

While the Module is operating, ensure that the:

-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Coil fluid temperature is within the acceptable range. <ol style="list-style-type: none">1. Lower the cool setpoint to engage cooling.2. Raise the coil fluid temperature actuator threshold until the MultiCool/Economizer Coil begins cooling.3. Up to one stage of DX cooling will be energized to help with the room heat load. If both stages come on, the coil fluid valve actuator should close down.4. After the verification of the MultiCool/Economizer actuator, return the liquid cooling threshold back to the original setting.5. Confirm that the coil fluid temperature activation threshold is within the building chilled water supply temperature (MultiCool) or the free-cooling setpoints on the dry cooler fans (Economizer). Adjust the coil fluid temperature activation threshold to operate within those ranges. |
| <hr/> | |
| <input type="checkbox"/> | Filters are clean and free of debris. |
| <hr/> | |
| <input type="checkbox"/> | Clogged filter alarm is operating properly. <ol style="list-style-type: none">1. Cover 1/3 of the filter area.2. Increase/decrease the clogged filter switch sensitivity so that the switch closes. Note: Only for use with new, clean filters. |
| <hr/> | |
| <input type="checkbox"/> | Every installed option is operating properly. |
| <hr/> | |
| <input type="checkbox"/> | Remote condenser/dry cooler/pump currents are recorded. |
| <hr/> | |
| <input type="checkbox"/> | Condenser/dry cooler setpoints, ambient stats, discharge leaving stats, and fan speed control setpoints are all recorded. |
| <hr/> | |
| <input type="checkbox"/> | Stand-by pump (for dual-pump systems) is operating properly. |
| <hr/> | |

Final Inspection Checklist

Ensure that the:

-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Interior and exterior of the system is clean and free from debris. |
|--------------------------|--|
-
- | | |
|--------------------------|--|
| <input type="checkbox"/> | Installed options (smoke detectors, firestat, water detector, remote sensor, remote relay shutdown, dry contact alarm, essential/nonessential lock-out, redundant Group control, condensate pump, etc.) are operating correctly. |
|--------------------------|--|
-
- | | |
|--------------------------|----------------------------------|
| <input type="checkbox"/> | Set the setpoints and deadbands. |
|--------------------------|----------------------------------|
-
- | | |
|--------------------------|---|
| <input type="checkbox"/> | Packaging materials are disposed of properly. |
|--------------------------|---|
-
- | | |
|--------------------------|--------------------------------|
| <input type="checkbox"/> | Send the start-up form to APC. |
|--------------------------|--------------------------------|
-

Warranty

Warranty Statement

LIMITED PRODUCT WARRANTY FOR APC PRODUCTS

The limited warranty provided by American Power Conversion Corporation (“APC”) in this Statement of Limited Factory Warranty applies only to Products you purchase for your commercial or industrial use in the ordinary course of your business.

LIMITED FACTORY WARRANTY

APC product covered

NetwrokAIR FM Precision Air Conditioning Unit

Terms of warranty

APC warrants that the Product shall be free from defects in materials and workmanship, for a period of one (1) year from the date of start-up when APC authorized service personnel has performed the start-up of the Product, or a maximum 18 months from the date of Product shipment from APC, when APC authorized service personnel has not performed the start-up of the Product (“Warranty Period”). In the event that the Product fails to meet the foregoing warranty, APC shall repair or replace any defective parts, such repair or replacement to be without charge for on-site labor and travel if APC authorized personnel have conducted start-up of the Product. An APC start-up service must be performed/completed by APC authorized service personnel or replacement of defective parts only will be covered. APC shall have no liability and no obligation to repair the installed Product if non-authorized APC personnel performed the start-up and such start-up caused the Product to be defective. Any parts furnished under this warranty may be new or factory remanufactured. **This warranty does not cover** circuit breaker resetting, loss of refrigerant, consumables, or preventative maintenance items. **Repair or replacement of a defective product or part thereof does not extend the original warranty period.**

Warranty extends to first purchaser for use, non-transferable

This Warranty is extended to the first person, firm, association or corporation for whom the APC Product specified herein (herein referred to as “You or Your”). This Warranty is not transferable or assignable without the prior written permission of APC.

Assignment of warranties

APC will assign to you any warranties which are made by manufacturers and suppliers of components of the APC Product and which are assignable. Any such warranties are assigned “**as is**” and APC makes **no representations** as to the effectiveness or extent of such warranties, assumes **no responsibility** for any matters which may be warranted by such manufacturers or suppliers and extends no coverage under this Warranty to such components.

Drawings, descriptions

APC warrants for the Warranty Period and on the terms of the Warranty set forth herein that the APC Product will substantially conform to the descriptions contained in APC’s Official Published Specifications or any the drawings certified and agreed to by an authorized APC representative, if applicable thereto (“Specifications”). It is understood that the Specifications are **not warranties of performance** and **not warranties of fitness for a particular purpose**.

Exclusions

APC shall not be liable under the warranty if its testing and examination discloses that the alleged defect in the product does not exist or was caused by your or any third person’s misuse, negligence, improper installation or testing, unauthorized attempts to repair or modify, or any other cause beyond the range of the intended use, or by accident, fire, lightning or other hazard.

There are no warranties, expressed or implied, by operation of law or otherwise, of products sold, serviced or furnished under this agreement or in connection herewith. APC disclaims all implied warranties of merchantability, satisfaction and fitness for a particular purpose. APC’s express warranties will not be enlarged, diminished, or affected by and no obligation or liability will arise out of, APC’s rendering of technical or other advice or service in connection with the products. The foregoing warranties and remedies are exclusive and in lieu of all other warranties and remedies. The warranties set forth above, constitute APC’s sole liability and your exclusive remedy for any breach of such warranties. APC’s warranties run only to you and are not extended to any third parties.

In no event shall APC, its officers, directors, affiliates or employees be liable for any form or indirect, special, consequential or punitive damages, arising out of the use, service or installation, of the products, whether such damages arise in contract or tort, irrespective of fault, negligence or strict liability or whether APC has been advised in advance of the possibility of such damage.

Warranty Procedures

Claims

You will need the model number of the Product, the serial number, and the date purchased. A technician will also ask you to describe the problem. If it is determined that the Product will need to be returned to APC you must obtain a returned material authorization (RMA) number from APC Customer Support. Products that must be returned, must have the RMA number marked on the outside of the package, and be returned with transportation charges prepaid. If it is determined by APC Customer Support that on-site repair of the Product is allowed, APC will arrange to have APC authorized service personnel dispatched to the Product location for repair or replacement, in APC's discretion.

Labor

- APC will support labor costs if a quality issue is found during start-up that is determined to be caused by workmanship or a factory defect.
- The mechanical contractor that is performing the repairs must call APC technical service to obtain a repair authorization number before any work is started.
- The mechanical contractor must provide detailed information, (photos, start-up sheets) to APC technical service before any repairs are started.
- If any repairs are performed without prior authorization, APC will not pay for any labor cost.
- APC will not support claims for any of the following:
 - Truck rental
 - Travel time
 - Rental on recovery machine and cylinders
 - Gas mileage
 - Solder, flux, sil-phos, silver solder, and silver solder flux.
- APC will pay for \$2.50 per pound for refrigerant.

To obtain a repair authorization number for a NetworkAIR product, call APC NetworkAIR technical services between 8:00 A.M. and 5:00 P.M. Eastern time, Monday through Friday:

- Phone: (1)(888)695-6500 (USA and Canada, toll free)
- Fax: (1)(401)788-2691

Parts

- APC warrants the parts of their systems for 1 year or 18 months from the ship date. This warranty only covers the cost of the part and not the labor for installation.
- Calls for warranty parts requests need to have specific unit information (serial number, model number, job number) to allow proper identification and processing of the warranty part transaction.
- A purchase order may be required to issue a warranty part(s). An invoice will be sent once the part(s) are shipped to the field. You have 30 days to return the part back to APC. After 30 days, the warranty invoice will be outstanding and payment of the invoice will be expected in full.
- Return authorization documentation will be sent with the replacement part. This documentation must be sent back with the defective part to APC for proper identification of the warranty return. Mark the warranty return number on the outside of the package.
- After the part has been received at APC, we will determine the status of the credit based on the findings of the returned part. Parts that are damaged from: lack of maintenance, misapplication, improper installation, shipping damage, and acts of man/nature will not be covered under the parts warranty.
- Any warranty parts request received before 1:00 PM EST will be shipped same day standard ground delivery. Any costs associated with Next Day or Airfreight will be the responsibility of the party requesting the part.
- Return freight of warranty parts to APC is the responsibility of the party requesting the part.

APC Worldwide Customer Support

Customer support for this or any other APC product is available at no charge in any of the following ways:

- Visit the APC Web site to find answers to frequently asked questions (FAQs), to access documents in the APC Knowledge Base, and to submit customer support requests.
 - **www.apc.com** (Corporate Headquarters)
Connect to localized APC Web sites for specific countries, each of which provides customer support information.
 - **www.apc.com/support/**
Global support with FAQs, knowledge base, and e-support.
- Contact an APC Customer Support center by telephone or e-mail.
 - Regional centers:

APC headquarters U.S., Canada	(1)(800)800-4272 (toll free)
Latin America	(1)(401)789-5735 (USA)
Europe, Middle East, Africa	(353)(91)702020 (Ireland)
Japan	(0) 3 5434-2021

- Local, country-specific centers: go to **www.apc.com/support/contact** for contact information.

Contact the APC representative or other distributor from whom you purchased your APC product for information on how to obtain local customer support.

To obtain a repair authorization number for a NetworkAIR product, call APC NetworkAIR technical services between 8:00 A.M. and 5:00 P.M. Eastern time, Monday through Friday:

- Phone: (1)(888)695-6500 (USA and Canada, toll free)
- Fax: (1)(401)788-2691

Entire contents copyright © 2003 American Power Conversion. All rights reserved.
Reproduction in whole or in part without permission is prohibited. APC, the APC logo, NetworkAIR, InfraStruXure, and MultiCool are trademarks of American Power Conversion Corporation and may be registered in some jurisdictions. All other trademarks, product names, and corporate names are the property of their respective owners and are used for informational purposes only.

